Report on International OIL AND GAS JOURNAL

other first in engineering
ill and high
ality . . .
the new

BJ POWAIRMATIC tubing tong

POWERFUL. A 5.3 hp vane-type air motor drives the new owairmatic Tubing Tong through a two-speed transmission hain drive. The motor, largest of its type available, and ficient drive assembly make the Powairmatic Tubing Tong ost efficient and powerful power tong on the market.

ER UNIFORM TORQUE. There's no guessing with the Powair- The motor drives the tool at 16 rpm in low gear . . . ops over 3980 ft lbs of torque at 90 psi for positive "make- or "break-out."

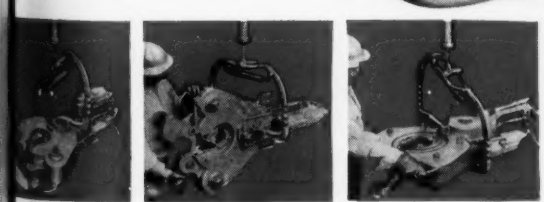
"SPINNING-UP". Wells get back in production much with the Powairmatic. Time is saved. Money is saved. element of fatigue is reduced. "Spinning-up" in high at 60 rpm with 1062 ft lbs of torque, the new owairmatic Tubing Tong saves up to 20 nes per round-trip on short strings!

VERSATILE. There's no throttle guesswork gn the jaw openings. More time is saved e Powairmatic with its automatic posi- g valve and cam which aligns auto- ally for swinging on and off the Ideal for wet jobs. A spring- d roll-over hanger provides instant reversal of the Tong . . . no awkward moves . . . no necessity to disconnect any parts. Easy reversal of the Powairmatic adds convenience to testing for collar or tubing leaks.

Can be used as a light rotary table. For drilling ratholes. Clean-out work. Inside cutting. For any light job . . . the design of the API chain drive and proper positioning of the high-quality bearings and sprockets maintain constant rotating speed.

OIL BATH LUBRICATION. Transmission and drive are enclosed in an oil bath, assuring proper lubrication for high-speed rotating parts. Standard alemite fittings for all other lubrication points.

INTERCHANGEABLE JAWS. Separate jaws and bushings are provided for tubing or drill pipe from 2" through 3½" O. D. Simple removal of one pin permits exchange of jaws and bushings. Full-length dies eliminate wobble and insure uniform grip without slipping or crimping. Write for complete information on the new BJ Powairmatic Tubing Tong. The Powairmatic is available now.



To reverse the tong, just roll it over.

BJ MEANS ENGINEERED OIL TOOLS

Byron Jackson Co.

Since 1872

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Mid-Continent Office and Plant, Houston 1, Texas
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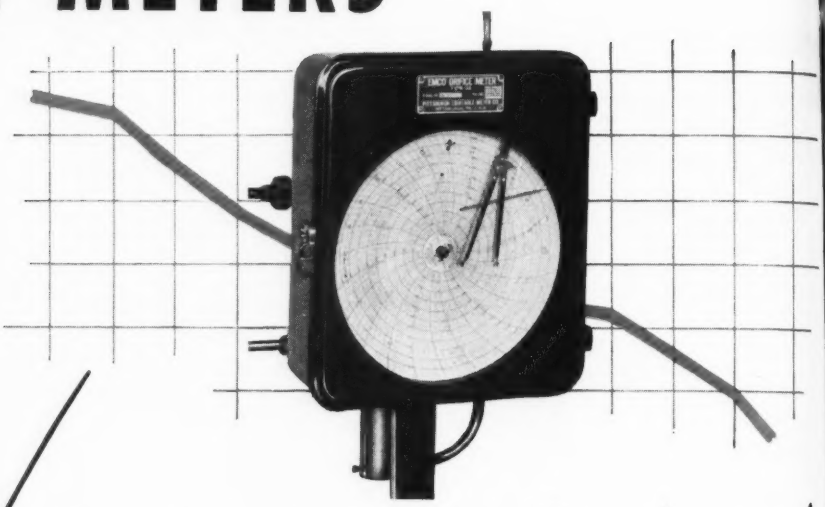
Branches in All Principal Oil Fields

EMCO

ORIFICE METERS



keep service costs down!

MATCH *RECORDED* ACCURACY
WITH *COMPUTED* ACCURACY
THE ROCKWELL-EMCO INTEGRATOR

Orifice meter accuracy frequently suffers when charts are computed. For the observation or inspection method of computing the total chart extension is at best only a close approximation and presents many opportunities for errors. The Integrator mechanically computes orifice meter charts. Accuracy is assured since the operator traces the same recording of static and differential as was made by the meter. The total appears at the completion of a chart cycle on a straight reading register. Ask for bulletin 1016.

It's sound business to keep orifice meters operating at top efficiency. For good management begins with good measurement. And good managers know that an orifice meter that's easy to service, economical to maintain is the best long time investment. More and more utility and oil company managers are specifying *instrument accurate* Rockwell-Emco orifice meters. For they've learned that the original high accuracy can be maintained for years at very low cost. It's simply a matter of better engineering, improved materials, heavier parts and a more accessible assembly.

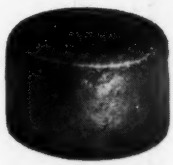
If you're not already familiar with this proven approach to *cost saving* measurement by orifice, it's time to ask the nearest District Office for an eye-opening demonstration.

Write for bulletin 1050

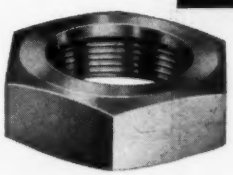
PITTSBURGH EQUITABLE METER DIVISION
Rockwell Manufacturing Company Pittsburgh 8, Pa.
Atlanta Boston Chicago Houston Kansas City Los Angeles
New York Pittsburgh San Francisco Seattle Tulsa

Toothed Lock Washer: Prevents loss of stem nut due to vibration, thereby holding the handwheel securely.

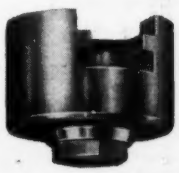
Newly Designed Handwheel: Air-cooled, finger grip handwheel affords sure grip even with greasy gloves.



Improved Packing: Molded packing of lubricated asbestos reinforced with copper wire. Suitable for practically every service. Valves can be repacked under pressure.

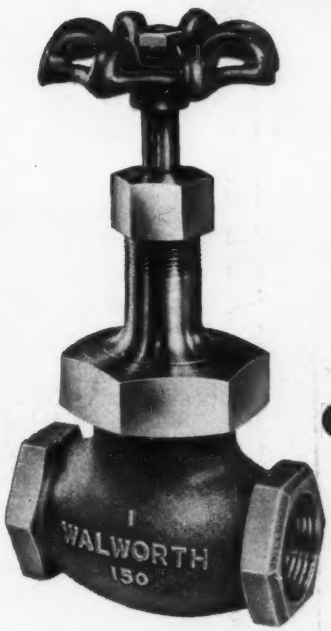


Hexagonal Union Bonnet Connection: Eliminates any chance of distortion or leakage even though valve is repeatedly taken apart and assembled.



New Cylindrical Disc Holder: The design of the top portion of the disc holder keeps the disc accurately guided under all operating conditions.

WALWORTH



IMPROVED
No. 95
BRONZE
GLOBE VALVE

also available in Angle Type (No. 96)

The service ratings of the Walworth No. 95 are 150 pounds per square inch steam at 500F, and 300 pounds per square inch non-shock cold water, oil, and gas. In the manufacture of this quality bronze valve, more than 47 gages are used in machining parts to micrometric accuracy, thus insuring interchangeability of parts. For further information see your local Walworth distributor, or write: Walworth Company, 60 East 42nd St., New York 17, N. Y.

note these 7 Great Features

WALWORTH
valves and fittings

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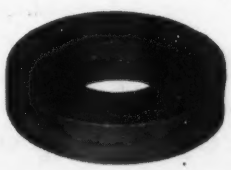
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



Renewable Asbestos Disc: This disc is suitable for steam up to 500F and is resistant to oil, gasoline, and many chemicals at atmospheric temperatures. Discs for special services are available.

Extra Strong Body: Made of Composition M (ASTM B61) bronze thick enough to provide a high safety factor. Valves undergo hydrostatic shell test of 450 psi.

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IS A "COOL CUSTOMER"...

WHEN IT COMES TO ENGINES...

. . . because its cylinder head has unusually large cooling water passages to provide uniform and efficient cooling. The trouble-free vapor cooling maintains even engine temperature, regardless of outside temperature or engine load with resultant savings in fuel. Diachrome valves and alloy exhaust valve insert seats assure long life and economical operation.

Fairbanks, Morse & Co., Chicago 5, Illinois

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A name worth remembering

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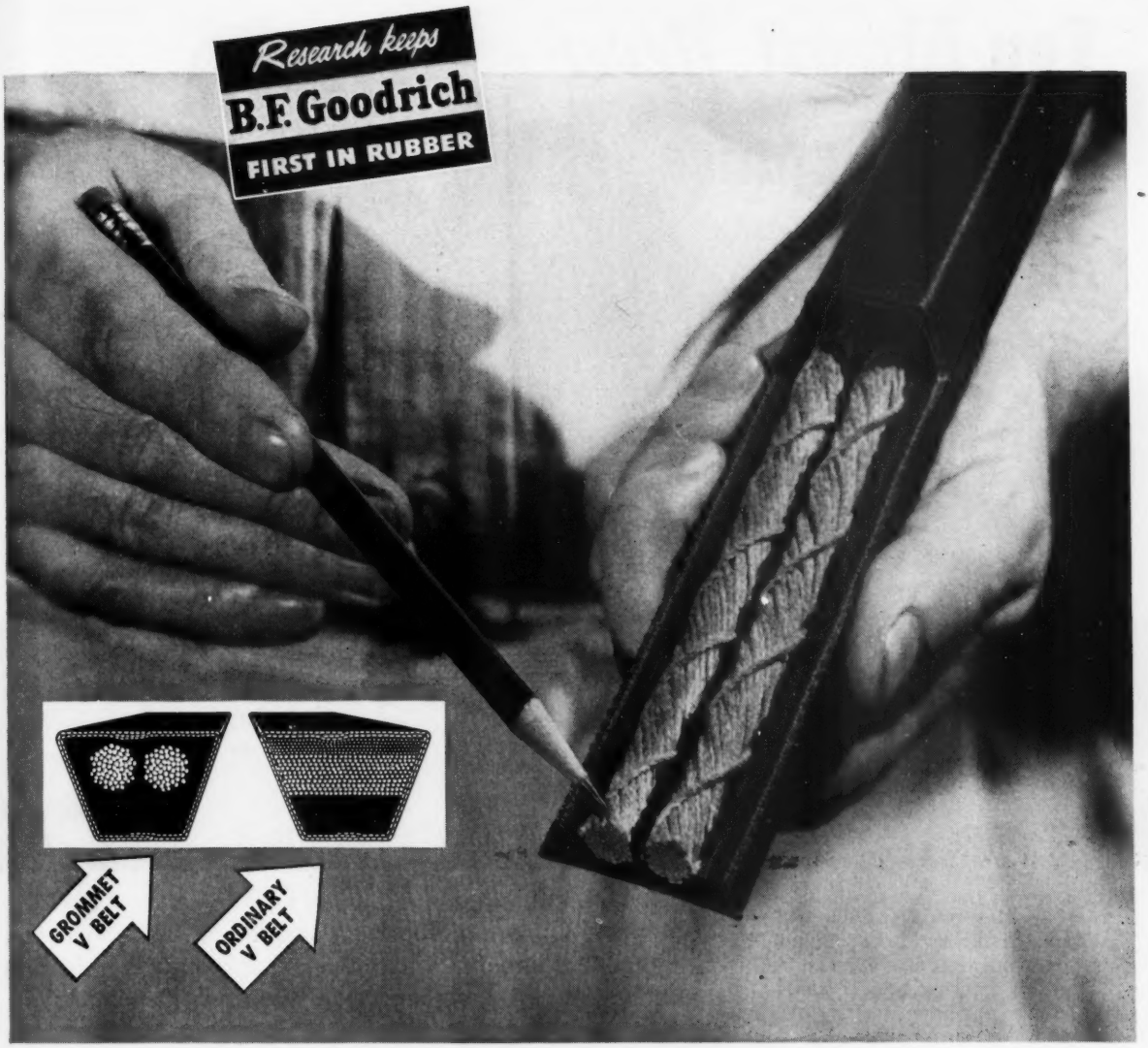


This V belt will cut your belt costs 20% to 50%

Only B.F.Goodrich makes the grommet belt—there's no other like it

THE B.F.Goodrich patented grommet belt lasts 20 to 50 per cent longer but costs no more than an ordinary V belt.

A grommet is *not a cable.* It is made by winding heavy cord *on itself* in an endless loop. (Cables are simply twisted cords; ends must be overlapped or spliced.)

Better than multiple cords. In a grommet belt all the cords work *all the time.* There are no cords in the *center* of the belt — which in an ordinary belt don't pull their share of the load.

More flexible. There is no splice, no stiff section where cords overlap. (85% of failures of ordinary belts occur in overlapped sections.) BFG belts have twin grommets, no fabric or plies in the middle of the belt that stiffen it and generate heat.

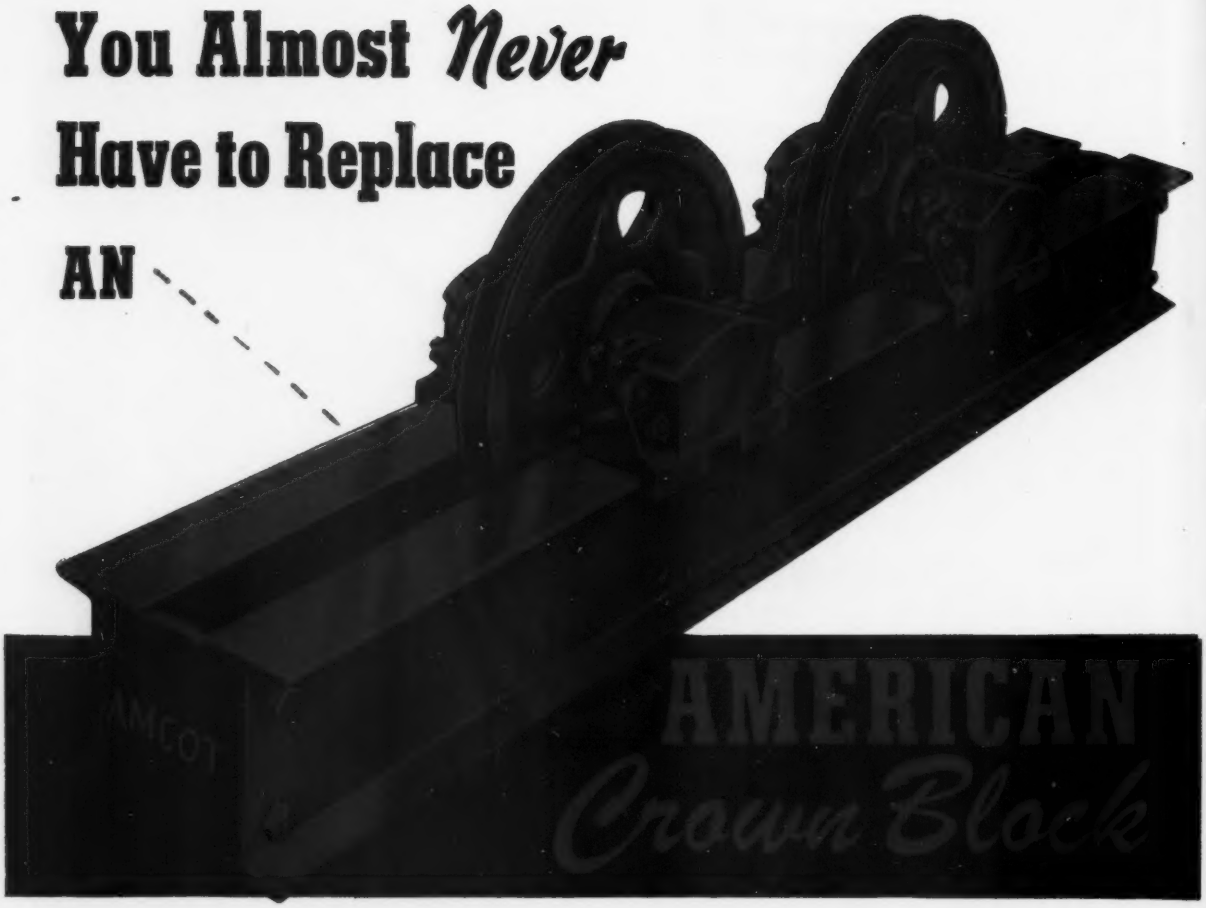
Stand shocks. Grommet belts run cooler, are stronger, have more *elasticity* but less *permanent* stretch than any other kind of belt. They stand sudden shock. Both laboratory and field tests have proved that they outlast all others, especially on hard drives.

Large sizes only. At present grommet belts are made only in largest sizes (D and E sections). Later, other sizes may be made.

More information. If you buy or use large-size V belts, don't do without the advantages grommet belts can give you. Talk to your BFG distributor. Or write, if you wish, for leaflet 2170. Address Dept. L-10, *The B.F.Goodrich Company, Industrial Products Division, Akron, Ohio.*

B.F.Goodrich
RUBBER FOR INDUSTRY

You Almost *Never* Have to Replace AN



SHEAVES—grooved to API specifications . . . machined and inspected . . . semi-steel, pressed on a steel shaft . . . furnished in any combination of sizes.

BEARINGS — Long bronze bearings are self aligning . . . oiled every revolution . . . protected against weather.

BEARING BOXES — adjustable along beam . . . hinged bearing cap . . . designed so box hooks over inside of beam . . . cannot get off beam.

BEAMS—standard I beam sections, joined with solid cast spreaders and tie bolts.

Once you put an American Crown Block in service you can forget it, except for occasional lubrication, which is quick and easy. In most fields, weather is as hard on crown blocks as the wear they receive, so American Crown Blocks are designed with full protection against bearing contamination and flushing by rain, and blowing sand and dirt. That's why today's American Crown Blocks are the safest, longest-lasting, most economical crown blocks we have ever built. Ready for shipment NOW in any quantity you need. Place your order today with your favorite supply store or the nearest American office.

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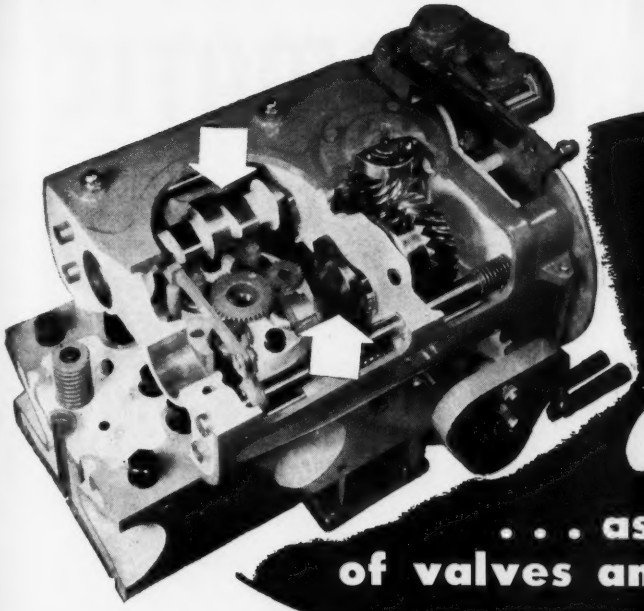


DUAL OVERHEAD CAMSHAFTS

. . . assure precise control of valves and fuel injection!

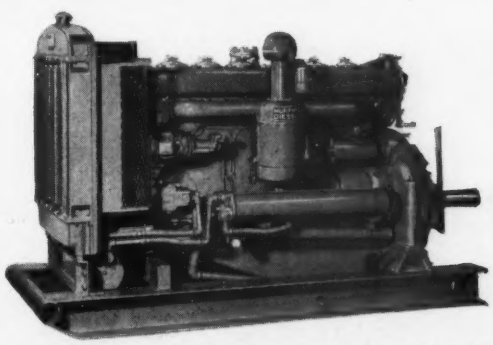
The MURPHY DIESEL has dual overhead camshafts...

BY using two overhead camshafts in place of a single shaft mounted in the crankcase, Murphy Diesels employ a short, direct drive to the valves and injectors. Consequently more accurate timing can be maintained which means a higher degree of operating efficiency and greater power output. Further, dual camshafts offer more wearing surface. Load, as compared with a single camshaft, is considerably reduced. This means less wear, less frequent adjustment and longer life.

Such additional features as "true" diesel operation, unit fuel injection, four valves per cylinder, flywheel end cam drive and the hydraulic servo-type governor offer further assurance of maximum economy and dependability. Get full details, today. Ask your Murphy Diesel Dealer for a copy of the booklet *"7 Questions to Ask a Diesel Engine Salesman"* or write to:

MURPHY DIESEL COMPANY
5305 West Burnham St., Milwaukee 14, Wisconsin

Two model ME-66 Murphy Diesels rated at 150 H.P. continuous, 180 H.P. intermittent, power this drilling rig.



Murphy Heavy Duty "True" Diesel Engines and Power Units 90 to 190 H.P.
Generator Sets 60 to 116 K.W., A.C. or D.C.

MURPHY DIESEL

LOWEST ULTIMATE POWER COST

FACTORY BRANCH—SALES, PARTS and SERVICE
416 SOUTH DETROIT AVENUE, TULSA, OKLAHOMA

LANDMATIC

means---

Dependable Production at Low Threading Cost

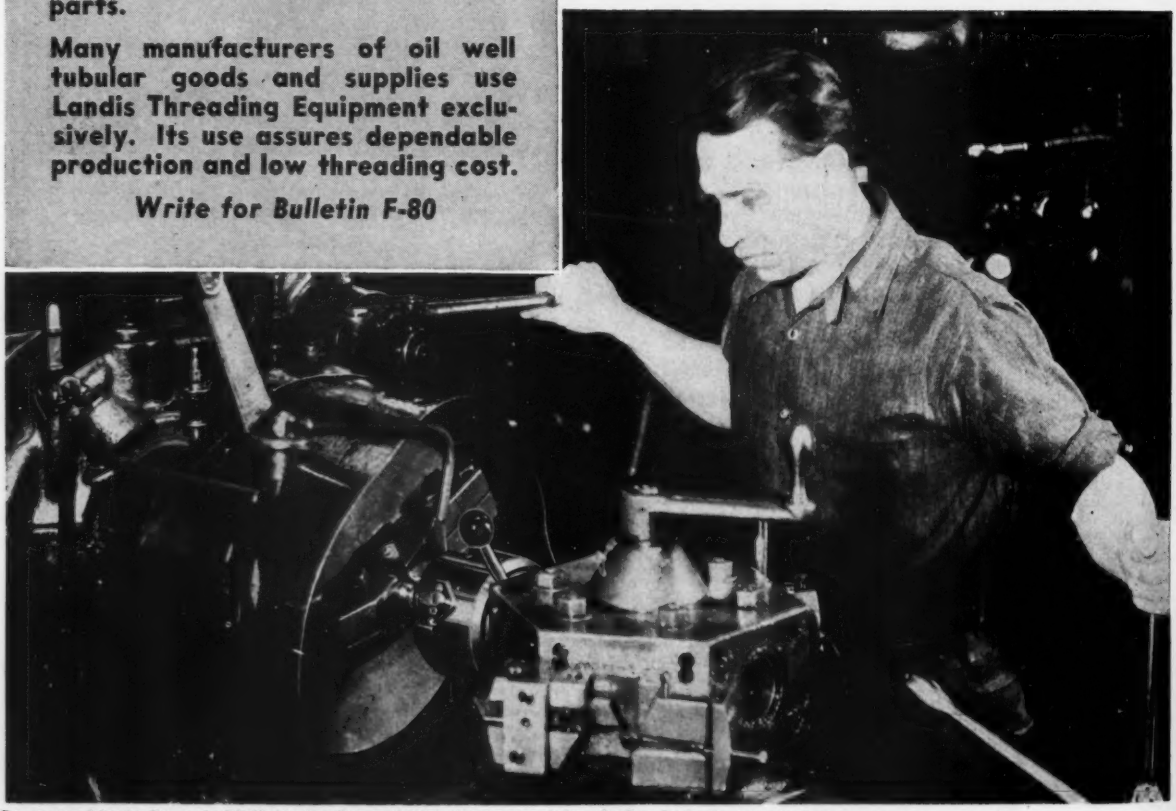
The Landmatic H type (Hardened and Ground) Die Head is shown threading Oil Well Sucker Rods.

The sturdy rigid construction of the H type Landmatic Head together with the few operating parts, all made from special alloy steel and hardened and ground, assure accurately formed threads well within the close tolerance specifications which have been set up for these parts.

Many manufacturers of oil well tubular goods and supplies use Landis Threading Equipment exclusively. Its use assures dependable production and low threading cost.

Write for Bulletin F-80

LANDIS MACHINE
Company
WAYNESBORO, PA., U.S.A.



Represented in the Domestic Oil Fields by: Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; C. J. Harter Machinery, Houston, Texas; Frederic-Baker Co., New Orleans, La.; Moore Machinery Co., Los Angeles and San Francisco, Calif.; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

POSITIVE SIDE-ACTION SLURRY with the first stroke of the pump

Larkin Geyser Shoes are constructed so that fluid is discharged *with the first stroke of the pumps* from a "perfect circle" area-way which completely encircles the shoe, rather than from individual lateral or oblique ports. Part of the cement slurry is also discharged downward from the bottom port.

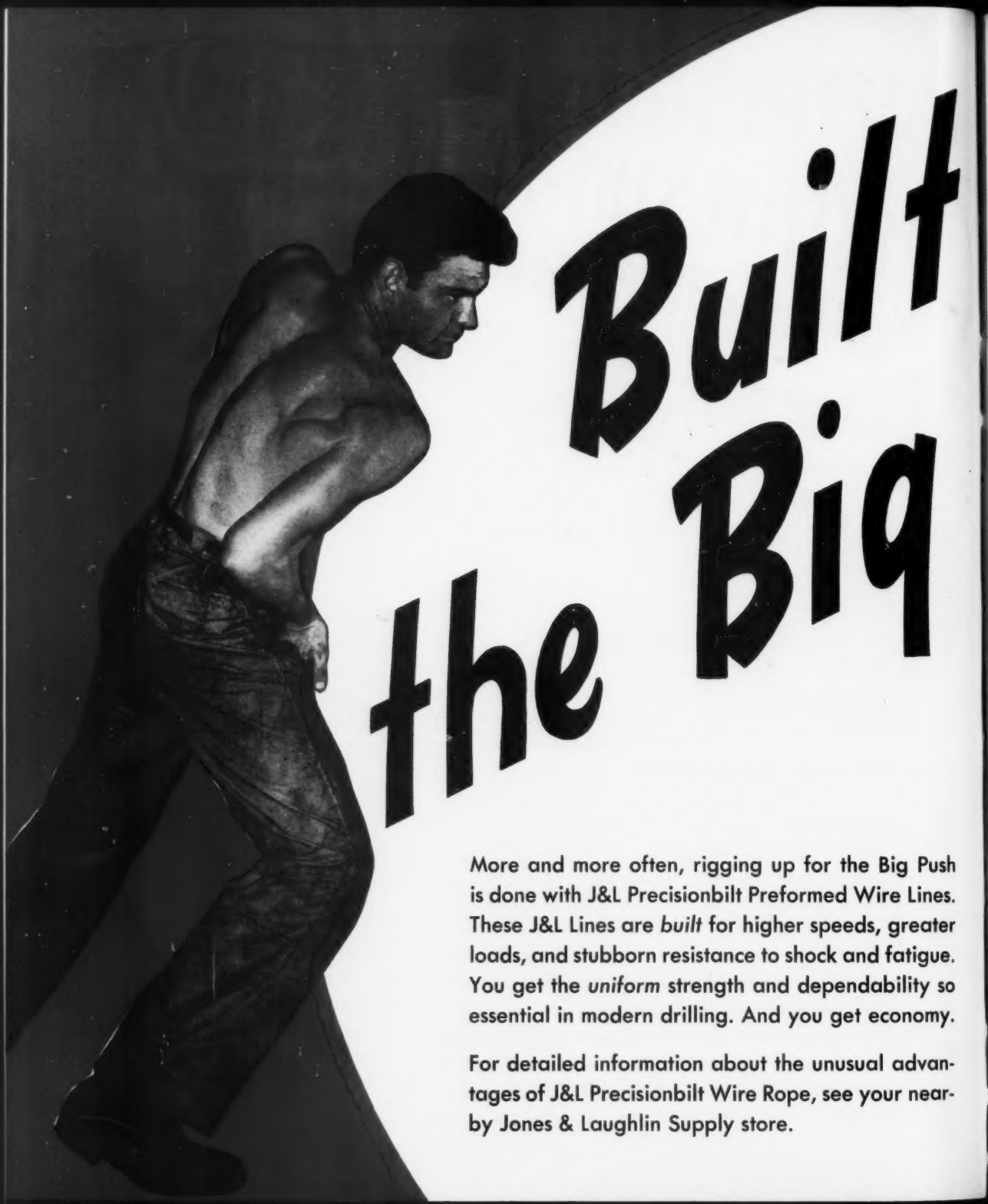
This Larkin side-action slurry . . . widely accepted as standard equipment for cementing success . . . contributes everything possible for successfully landing and cementing casing: *it washes out cavings, bridges and other obstructions — it washes mud cake from the well bore — it distributes slurry evenly at the shoe point — it minimizes channeling.*

So measure the value of your cementing equipment by what it will do. Buy Larkin floating and guiding equipment through your supply store.

LARKIN

...Through Your Supply Store

LARKIN PACKER COMPANY, INC.
ST. LOUIS, MO.



Built the Big

More and more often, rigging up for the Big Push is done with J&L Precisionbilt Preformed Wire Lines. These J&L Lines are *built* for higher speeds, greater loads, and stubborn resistance to shock and fatigue. You get the *uniform* strength and dependability so essential in modern drilling. And you get economy.

For detailed information about the unusual advantages of J&L Precisionbilt Wire Rope, see your nearby Jones & Laughlin Supply store.

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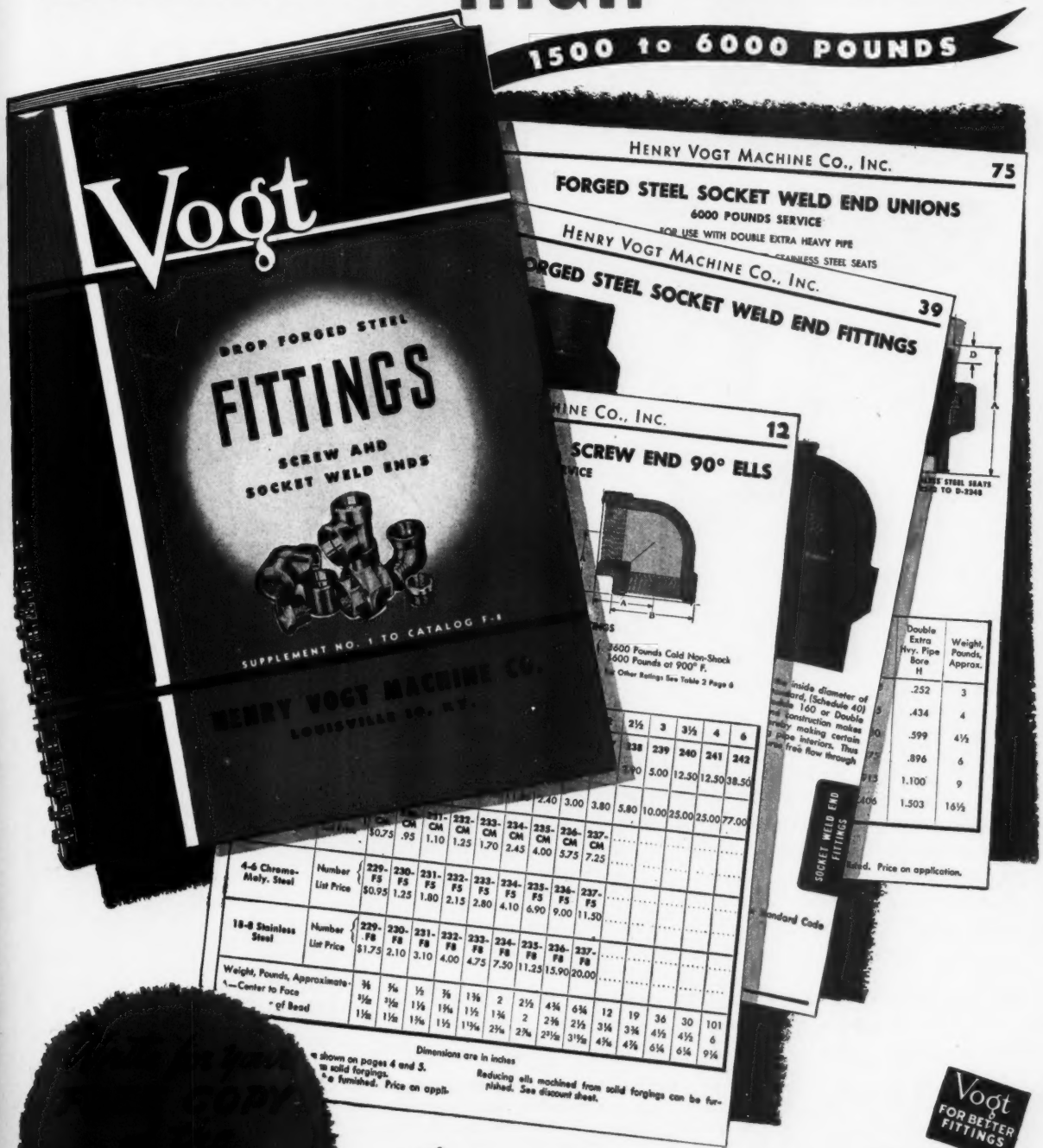
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DROP FORGED STEEL
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FOR USE WITH DOUBLE EXTRA HEAVY PIPE
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(or begone, hydrogen sulphide)

Would be nice if the growing problem of liquid hydrocarbon purification could be settled by magic spell. The next best thing is a Girdler GIRBOTOL plant. The GIRBOTOL process, noted for effective, economical hydrogen sulphide removal in the gaseous phase, has been adapted with equal effectiveness and economy to hydrogen sulphide removal from butane, propane, polyfeed stocks, straight run naphthas, and gasoline. Twenty plants are now operating or under construction. If you have a liquid stream containing 500 pounds or more of hydrogen sulphide per day, a Girdler GIRBOTOL plant will save money. Investigate.

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DESIGNERS, ENGINEERS, AND CONSTRUCTORS

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Girdler's versatile, practical experience includes processes for gas manufacture, purification, separation, dehydration—processes involving hydrogen sulphide, hydrogen chloride, carbon monoxide, carbon dioxide, inert and controlled atmospheres, natural gas, synthesis gas, refinery gases, liquid hydrocarbons, hydrogen, nitrogen, elemental sulphur.

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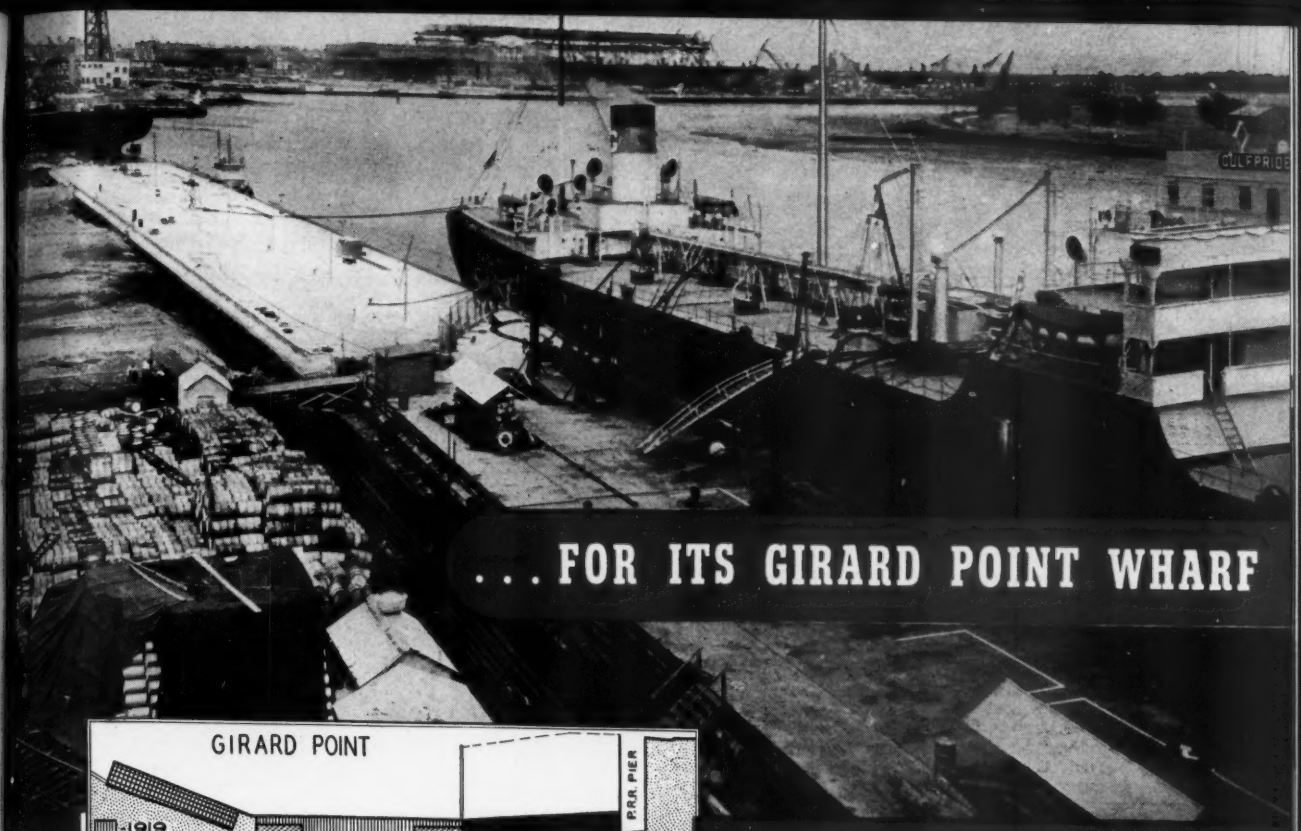

. . . FOR ITS GIRARD POINT WHARF

The Project

For the fourth time in 25 years the Gulf Oil Corporation entrusted to Raymond the construction of a new wharf at its Girard Point Refinery on the Schuylkill River near Philadelphia. The work included the removal of an old wooden approach and the construction of a new concrete wharf. The wharf consisted of a reinforced concrete deck involving 2300 cubic yards of concrete supported on 100 precast concrete piles up to 82 feet in length with approximately 700 precast concrete sheetpiles 40 feet in length. Included in the project was the construction of a fender system, the electrical installations, the mooring bollards and the dredging of the river bottom to a depth of 35 feet along the face of the wharf.

Raymond's reputation in the industry is based on satisfied clients and repeat orders of this kind.

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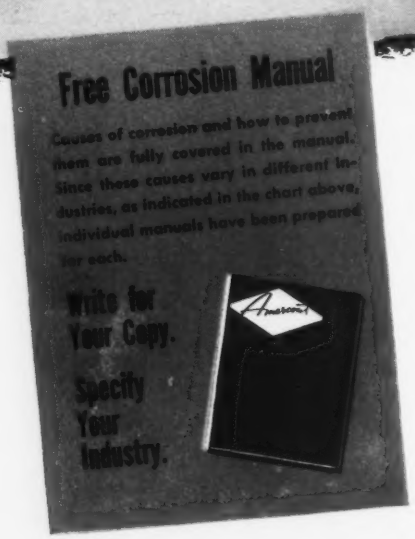
THE RAYMOND ACTIVITIES include every recognized type of foundation construction—concrete, composite, precast, steel, pipe and wood piles. Also caissons, underpinning, construction involving sheet protection, shipbuilding facilities, harbor and river improvements and borings for soil investigation.

PROTECTIVE COATINGS?

That is the problem... here is the solution!

Typical Petroleum Industry Uses

COATING	DESCRIPTION AND USES	CHARACTERISTICS OF EXPOSURES
#33	A single solution general maintenance coating for exterior metal, concrete and wood surfaces. Excellent resistance to corrosive fumes, condensation and spillage from acids, salts and alkalies. Recommended for exterior of tanks, piping, drill rigs, machinery and concrete structures.	Weathering, salt air, chemical fumes, acid and alkali spillage, hydrogen sulfide, ammonia, sulfur dioxide and hydrochloric acid fumes—as well as condensation of moisture, extreme temperature changes and abrasion.
#23	A three component system recommended as an interior lining for steel or concrete tanks containing sour crude, automotive and aviation gasoline, acid and salt solutions. No. 23 protects the tank against corrosion and prevents contamination of gasoline by rust. Highly recommended for lining cargo tanks in tankers.	Sour crude, refined oils, gasoline, diesel fuel, hydrogen sulfide, salt water, alu... highly corrosive chemicals.
#44	A three component coating system for extreme acid and hydrogen sulfide conditions as is sometimes found in acidizing tanks, Perco sweetening systems, acid storage tanks, acid and alkali pumps, and acid sludge tanks.	No. 44 offers unusual pr... ids and alkalies in a variety of ... Excellent resistance to hydroge...
#61	A silicone resin base coating designed for temperatures up to 600° F. Especially recommended for hot surfaces such as engine exhausts, manifolds, stacks and boiler breachings where good resistance to chemical fumes and weathering is also required.	No. 61 effectively resists sal... temperatures.
Tube and Tank Lining	Three component coating system designed for application to the interior of production tubing, salt water disposal pipe, pipe line tanks, floating roof tanks; and to drill stem, sucker rods and casings.	Resists corrosion from hydrogen sulfide, salt water, sour crude, calcium, and magnesium chloride brine. Effectively reduces the build up of paraffin and gyp scale in tubing.


Free Corrosion Manual
Causes of corrosion and how to prevent them are fully covered in the manual. Since these causes vary in different industries, as indicated in the chart above, individual manuals have been prepared for each.
Write for Your Copy.
Specify Your Industry.
Amercoat

Follow the Amercoat line of most resistance...

AMERCOAT Protective Coatings are remarkably versatile in their inherent chemical resistance and non-contaminative properties. Yet, no single protective coating formula can provide maximum surface protection under all conditions, without compromise on some desirable quality. Therefore, AMERCOAT formulas are designed for specific uses in industry. They range from specialized linings for chemical and food tanks to general maintenance coatings for metal or concrete surfaces. Each provides maximum protection in its field.

Chemically inert, tougher and much more durable than conventional paint, these remarkable AMERCOAT Coatings are easily applied by brush or spray to metal, concrete or wood. They dry quickly and are extremely resistant to abrasion.

AMERCOAT DIVISION

AMERICAN PIPE AND CONSTRUCTION CO.

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The Koch Kaskade Tray is much superior to the bubble tower for
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RIG UP FASTER

On barge, piling or land installations, Emsco "J" rigs require a minimum of set-up time. Exclusive "stair-step" design permits placing of engines, compounding transmission and selective speed transmission at any desired level. Rig may be flat set, medium-step or full stair step to meet varying height substructures.

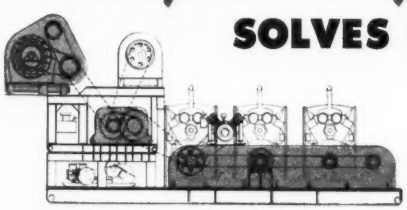
DRILL MORE EFFICIENTLY

Unlimited operating flexibility . . . that's the key to the deep drilling efficiency of Emsco "J" rigs. These rigs may be powered by two, three or four engines of a wide variety of types and makes. Two slush pumps may be driven at different speeds simultaneously.

TRANSPORT EASIER

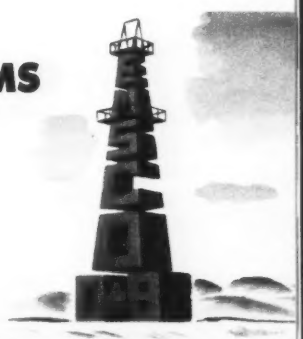
Emsco "J" rigs consist of three basic packages—drawworks, selective speed transmission and compounding transmission. All units meet road clearance requirements. "Stair-step" design eliminates need of heavy bulky subbases under engines and compounding transmission. Hauling weight is substantially reduced.

Packaged Design OF EMSCO "J" RIGS SOLVES DEEP DRILLING PROBLEMS



EMSCO "J" SERIES drilling Rigs consist of three basic units—drawworks, selective speed transmission and compounding transmission. This "packaged design" has increased the efficiency of every phase of the drilling operation, from the original rigging-up to the final tear down and move to another location. Long "V" belt and chain drives are eliminated. Rig requires a minimum of set-up time. Completely air-operated controls centralized at the driller's position speed up drilling operations. Rig design permits use of any or all of the following accessories: sand reel; hydromatic or dynamatic brakes; washdown pump; any type of feed-off device; generators; and compressors.

For rigs engineered to the drilling needs of today and tomorrow, talk to your nearest Emsco representative. He will show you how Emsco "J" rigs can lower your deep drilling costs.



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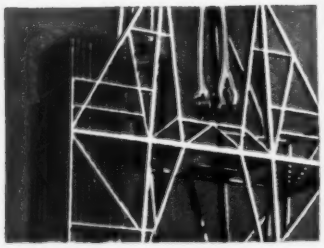
General Offices: DALLAS, TEXAS • Export Division: 30 Rockefeller Plaza, NEW YORK, N. Y. • Representatives: ARGENTINA • BOLIVIA • CHILE • COLOMBIA • ENGLAND JAVA • MEXICO • PERU • TRINIDAD • VENEZUELA

Sturdy Travelers...

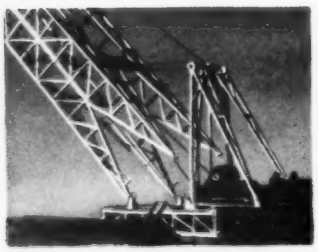
EMSCO BULGE TYPE PORTABLE MASTS

Easy to erect . . . safe to operate . . . quick to move! These are the operating characteristics of Emsco Bulge Type Portable Masts. For here are completely portable units designed and engineered for drilling to 15,000 feet. They may be quickly dismantled, moved to another location, and rigged up with a minimum of time and expense. Ask your nearest representative for complete information.



Exclusive *bulge* feature permits racking pipe inside base of mast. Casing may be run with drill pipe in bulge. Split board working platform speeds drilling operations.

Lacing of all four faces of mast eliminates need for interior bracing; gives unobstructed visibility to both driller and derrick man; minimizes vibration and weaving.



Mast easily and safely erected by drawworks. Patented safety features insure positive control. Mast is readily dismantled into road width packages, or moved intact.

A SIZE AND TYPE TO MEET EVERY DRILLING REQUIREMENT

12PA—94' welded and painted
12PE—94' bolted and galvanized

17PA—129' welded and painted
17PE—129' bolted and galvanized

17PS—136' welded and painted
17PSE—136' bolted and galvanized

18P—136' welded and painted Available with 1 or 2 bulges. Load rating 800,000 lbs.

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Because of their molybdenum content, all of these Croloys are superior to many of the plain stainless grades, not only in combating corrosion, but also in their resistance to creep and oxidations at elevated temperatures. Their time-saving, cost-cutting advantages have been convincingly demonstrated in a wide variety of severe service conditions.

B&W can supply these Croloy analyses in both seamless and welded tubes. Perhaps they will solve tough tubing problems in your plant as they have in others. So ask today for full information.

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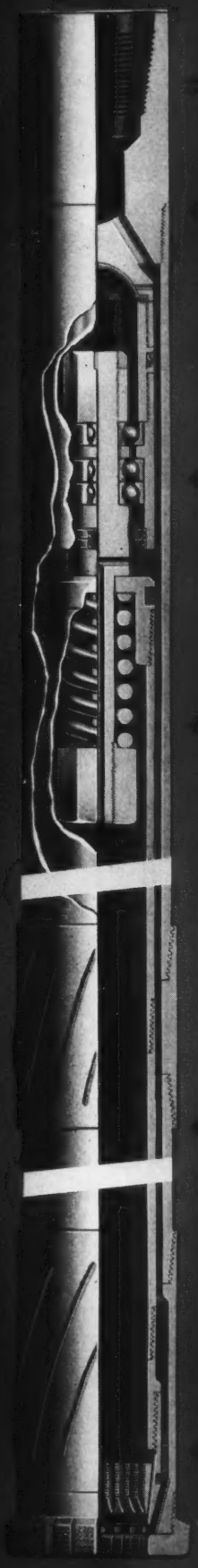
TRUCO OIL FIELD DIAMOND HEAD + D & S CORE BARREL =RESULTS



Fully enclosed bearings—grease packed—diaphragm to equalize pressure leaving non-rotating inner tube

Double tube, 50 foot core capacity with minimum of joints

Inner tube flush joint inside and out. Smooth inner-tube bore

Core Catcher inside inner tube minimizing core disturbance and blocking.

100% Core Recovery is Easy with this Unbeatable Combination

The unique thing about D & S Core Barrels and Truco Oil Field Bits is that in combination they offer not just a modest improvement in core recovery but 100% recovery as their usual performance. No matter what formations you are working in, when you combine the irresistible cutting power of Truco Bits with the operating efficiency of D & S Core Barrels you get results.

Drill bits in any size from 4¼" up. Diamond reamers. Diamond rotary shoes of any size.

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14 Buda "Twins" g
power and speed fo

BUDA
6DC-1879
DIESEL

14

BUDA DIESELS					
Model	Cyl.	Bore & Stroke	Displ.	HP Range	RPM Range
BD-153	4	3 7/16 x 4 1/8	153	19 to 40	1000 to 2400
BD-182	4	3 3/4 x 4 1/8	182	23 to 47	1000 to 2400
BD-230	6	3 7/16 x 4 1/8	230	28 to 60	1000 to 2400
BD-273	6	3 3/4 x 4 1/8	273	37 to 72	1000 to 2400
DT-468	6	4 1/4 x 5 1/2	468	42 to 113	700 to 2000
DC-645	4	5 5/8 x 6 1/2	645	59 to 119	700 to 1400
DC-844	6	5 1/4 x 6 1/2	844	77 to 180	700 to 1800
DCS-844**	6	5 1/4 x 6 1/2	844	82 to 225	700 to 1800
DC-1125	8	5 1/4 x 6 1/2	1125	103 to 240	700 to 1800
DC-1879*	6	6 3/4 x 8 3/4	1879	170 to 257	700 to 1200
PCD-1879†	6	6 3/4 x 8 3/4	1879	170 to 257	700 to 1200
DCS-1879**	6	6 3/4 x 8 3/4	1879	210 to 330	700 to 1200
DC-2505	8	6 3/4 x 8 3/4	2505	227 to 344	700 to 1200
DCS-2505**	8	6 3/4 x 8 3/4	2505	280 to 440	700 to 1200

BUDA GAS-GASOLINE					
Model	Cyl.	Bore & Stroke	Displ.	HP Range	RPM Range
B-153	4	3 7/16 x 4 1/8	153	15 to 49	800 to 2800
B-182	4	3 3/4 x 4 1/8	182	22 to 53	800 to 2600
B-230	6	3 7/16 x 4 1/8	230	25 to 73	800 to 3200
B-273	6	3 3/4 x 4 1/8	273	31 to 81	800 to 2800
LO-525	6	4 1/2 x 5 1/2	525	41 to 157	600 to 2400
MO-645	4	5 5/8 x 6 1/2	645	50 to 111	600 to 1400
MO-893	6	5 5/8 x 6	893	74 to 200	600 to 1800
MO-970	6	5 5/8 x 6 1/2	970	80 to 212	600 to 1800
MO-1290	8	5 5/8 x 6 1/2	1290	118 to 288	600 to 1800
PC-1879	6	6 3/4 x 8 3/4	1879	173 to 246	700 to 1200
PCG-1879†	6	6 3/4 x 8 3/4	1879	173 to 246	700 to 1200
PCS-1879**	6	6 3/4 x 8 3/4	1879	200 to 340	700 to 1200
PC-2505	8	6 3/4 x 8 3/4	2505	230 to 322	700 to 1200
PCS-2505**	8	6 3/4 x 8 3/4	2505	267 to 454	700 to 1200

NOTE: Above chart lists "Twin" models only . . . complete Buda line includes additional models.

* Can also be modified to operate efficiently on crude oil.

** Supercharged. † Convertible from Diesel to Natural Gas, or vice versa.

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Wherever there's oil there's Buda

ENGINES • PARTS • SERVICE

give you matched
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Plus interchangeable parts* and mountings!

To help you lick the problem of "one engine fuel today . . . another tomorrow," Buda offers you a choice of 14 oil field engine "Twins" that develop approximately *equal** power and efficiency on either Diesel, gasoline, natural gas, butane or propane fuel. Skillfully matched in displacement and speed characteristics, these 14 Buda "Twins" also provide *complete* interchangeability of mounting dimensions . . . *up to 85%* interchangeability of all wearing parts in any particular series.

This *exclusive* "Twin" design by Buda opens the door for new flexibility and economy in oil field operations because it lets you choose your engines "to fit the fuel". . . *change from one to the other right on the job* . . . without sacrificing performance . . . without any costly alterations in rigs and mountings . . . without complicating your parts and maintenance problem. See your Buda Oil Field Distributor today for complete information, or write us direct. The Buda Company, Harvey, Ill.

* *Additional Buda models, not included in this "Twin" grouping, provide even greater range of interchangeability for increasing or decreasing power as needed.*

BUDA

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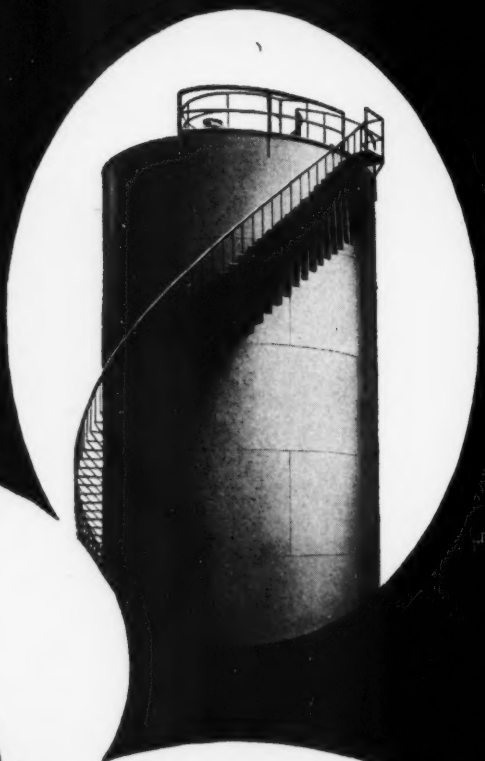

HAMMOND designs, fabricates and erects tanks of all types for liquid and dry storage . . . above or below ground . . . high or low pressure . . . cone roof . . . HAMMOND SPHERE . . . floating roof . . . VAPOR-LIFT . . . spheroid . . . GLOBE ROOF PRESSURE . . . gas holder . . . also stainless and stainless-clad vessels of all types and designs for the petro-chemical industries.

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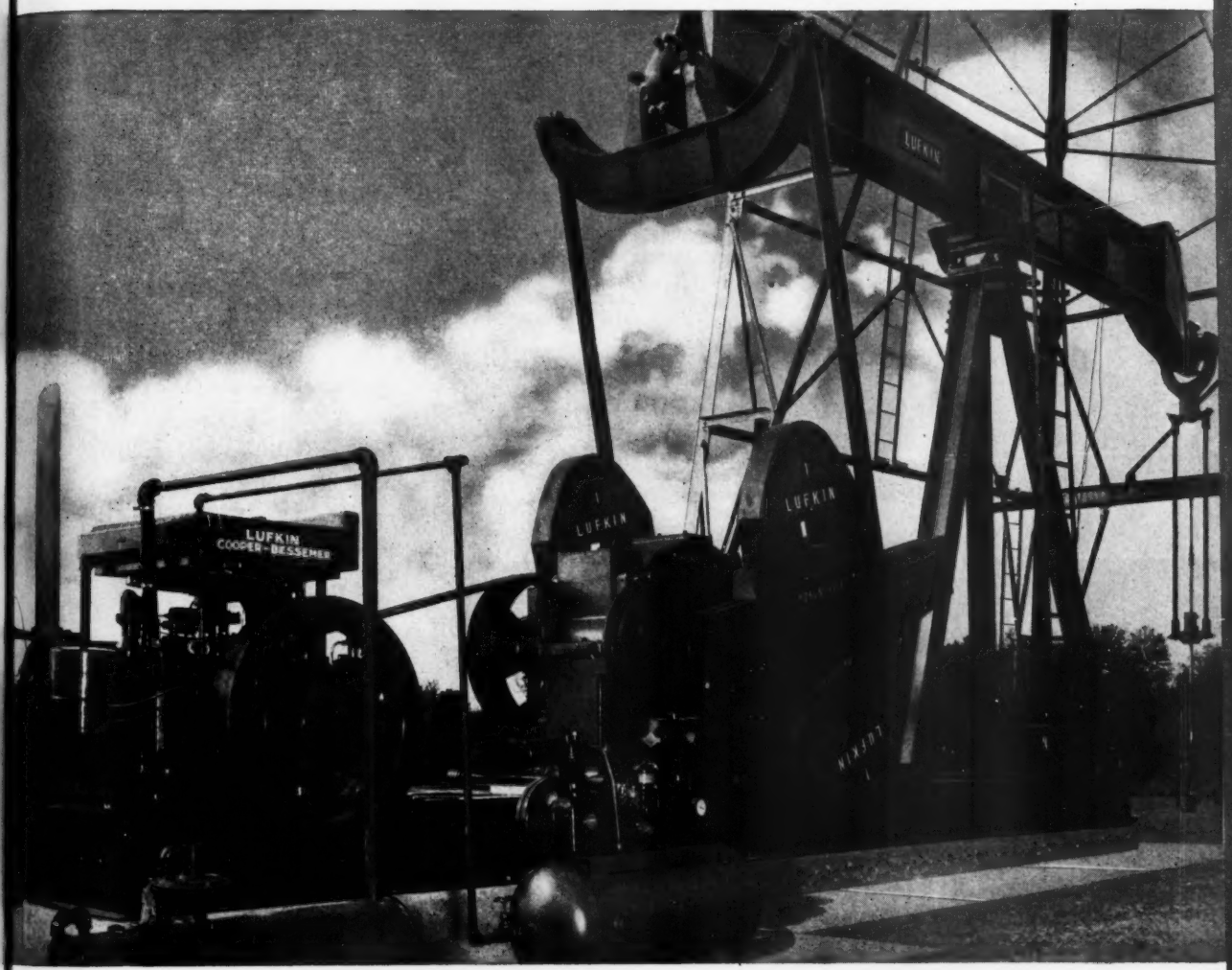
LUFKIN *Pumping Units*



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always operating at top efficiency—always low in maintenance. You can depend upon Lufkin Units for long, trouble-free service. Lufkin Units, installed more than a quarter of a century ago, are still performing daily with hardly any noticeable difference since original installation.

We manufacture a full line of commercial speed reducers and increasers. More than 60,000 sets have been produced in our Lufkin plant. Send for catalog today.

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THE MOST ADAPTABLE OF

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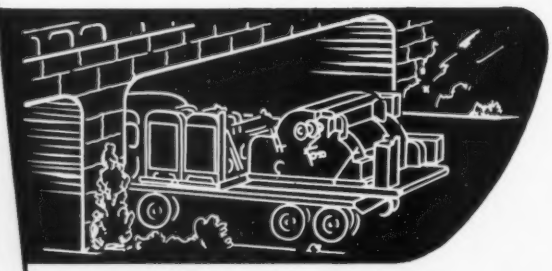
PORTABILITY



ROADABILITY

The Wilson Giant ROADMASTER is the last word in portability. It meets road clearance requirements... easily clears underpasses... weighs less... compact in every respect. The Roadmaster increases the speed and efficiency of every phase of drilling, from hauling and rigging-up to moving to another location.

ALL IN ONE SINGLE LOAD

The Wilson Giant ROADMASTER Compound makes it possible to transport the drawworks, transmission, engines, compound and pump drive shaft *all in one single load*. The overall width at the end of the compound shafts with NKU Waukesha engines is under 11 feet, and 10 feet 6 inches using General Motors' Twin 6-71 and Le Roi V-8 engines. A special rotary table drive can be furnished to keep the entire rig within the above dimensions by removing the catheads.

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Wilson

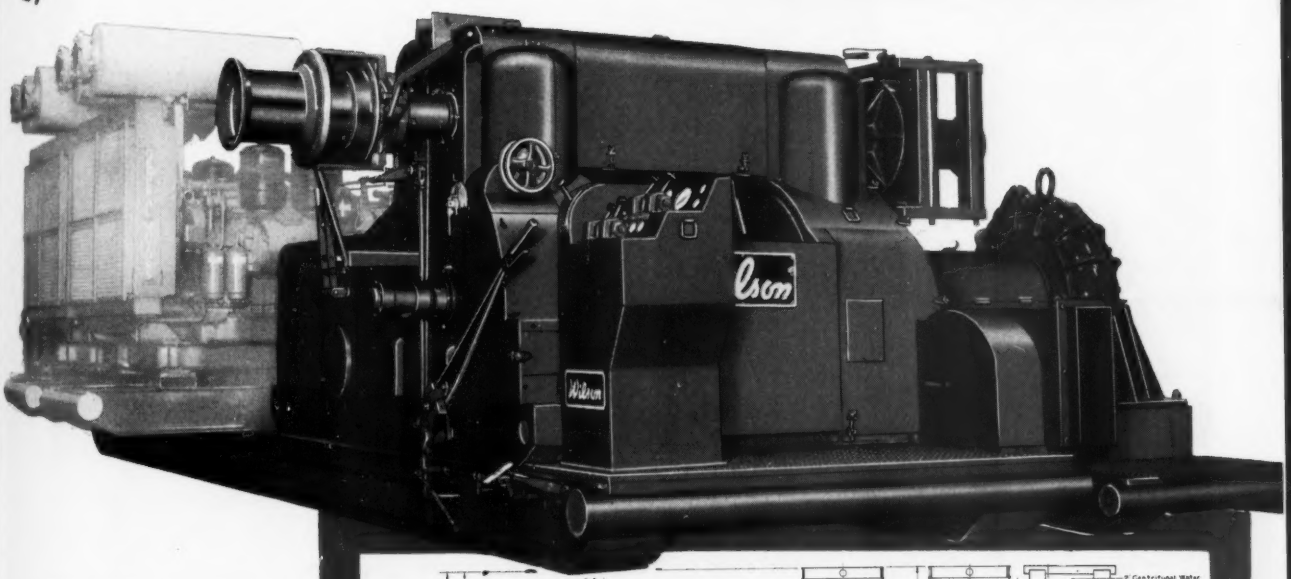
MANUFACTURING CO., INC.

WICHITA FALLS, TEXAS

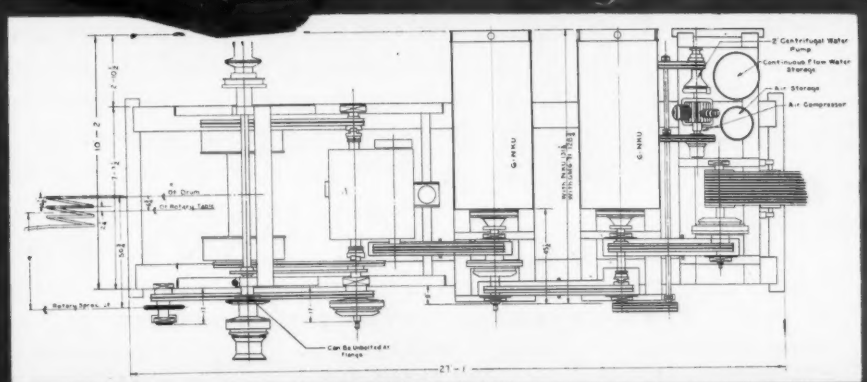
LE OF DRILLING RIGS ....

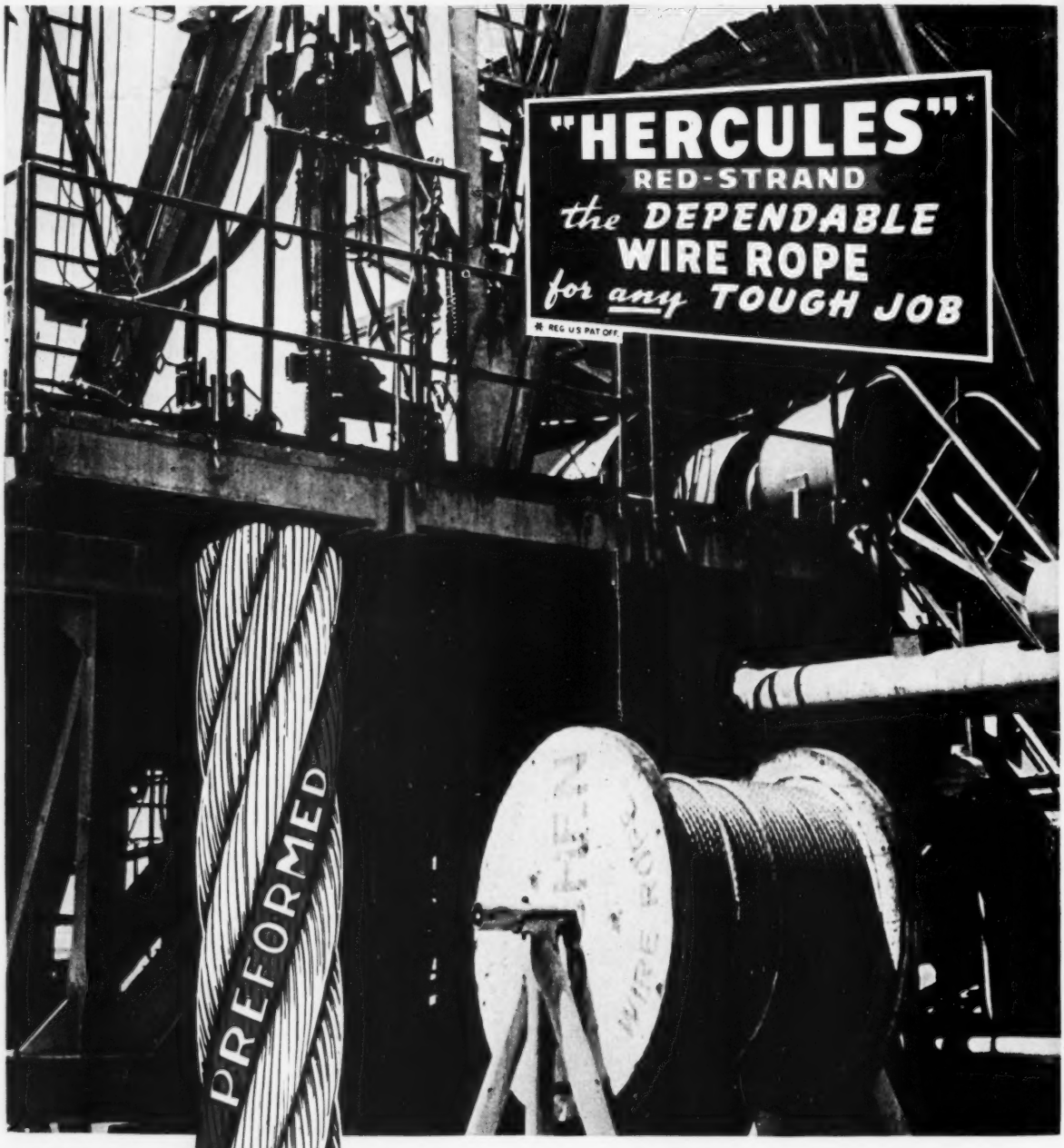
n GIANT *Roadmaster*

OVERALL WIDTH UNDER 11 FEET



The Wilson Giant Rig is the only rig in its capacity class rated to take either 2 LRO Waukesha or V-12 Le Roi engines, or 3 LI-600 Cummins, V-8 Le Roi or NKU Waukesha engines.





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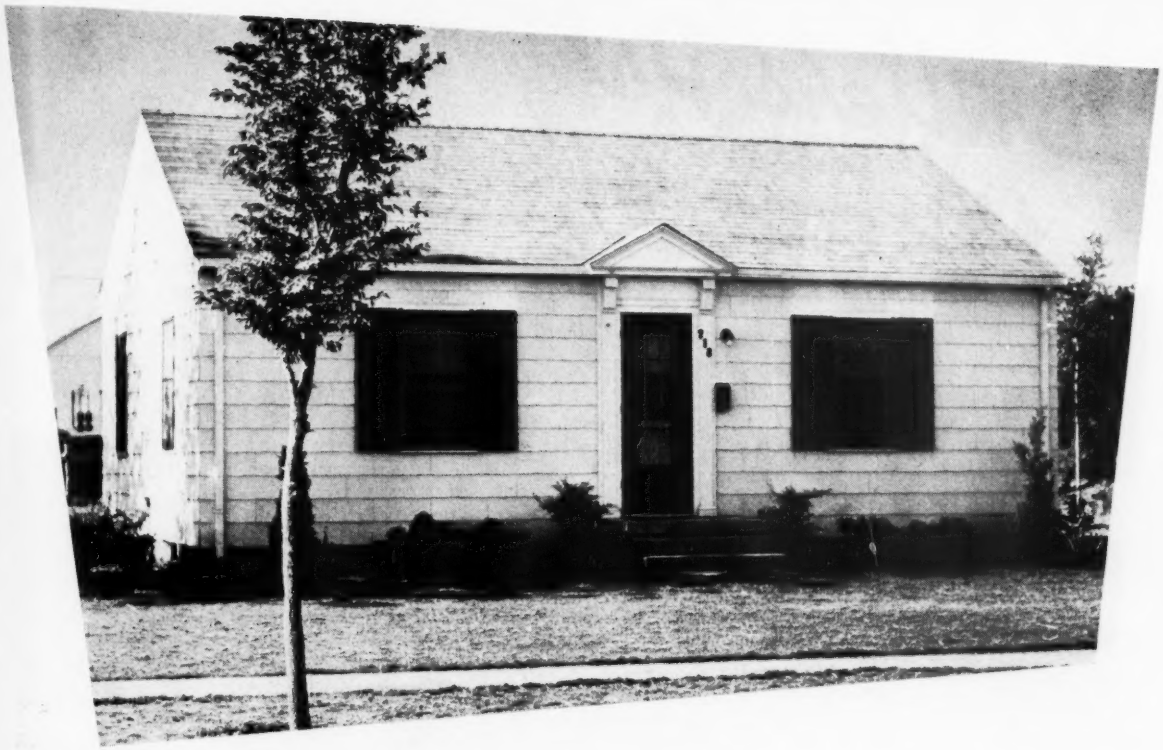
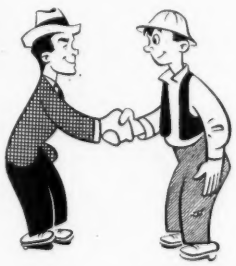


Good Housing is Good Employee Relations



Workers and their families are happier when they have good living conditions as well as good working conditions. They are much more contented when their homes are modern, well arranged and comfortable.

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STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125-45 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

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THE N-7 DRAWWORKS

The Brewster N-7 Team has been [illegible] together — and perfectly matched — to give you maximum drilling efficiency and economy. The N-7 Drawworks is conservatively rated for drilling to 7500′ with 4½″ pipe. With twelve line speeds and six rotary speeds, it is compact and easily portable. Entirely air-controlled from centralized control panel. For full details write now for N-7 Catalog OG 107.

For information about the N-2 Team (for 2500′ drilling) ask for Catalog OG 108; about the N-4 Team (for 4500′-5500′ drilling) ask for Catalog OG 113.

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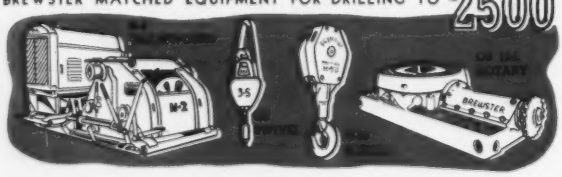
BREWSTER MATCHED EQUIPMENT FOR DRILLING TO 2500′



BREWSTER MATCHED EQUIPMENT FOR DRILLING TO 5500′

..... for drilling to 7500'

WITH MATCHED EQUIPMENT

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ROTARY

Tough, hea[illegible]ed spiral bevel gears. Rugged box type frame with bed and skids integral. Full 18" table opening. Three large oil reservoirs. Quick, positive table locks.

200 TON

BLOCK

Perfectly b[illegible]rced for straight fall. Streamlined — no dangerous projections to hang up. Straight line travel without weave or wobble. Double-row tapered roller bearings on each sheave.

6-S OIL BATH

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Features for[illegible]al design with minimum parts. Streamlined for safety. High capacity bearings with positive, continuous lubrication and cooling. Maximum strength with minimum weight.

THE BREWSTER CO., INC.

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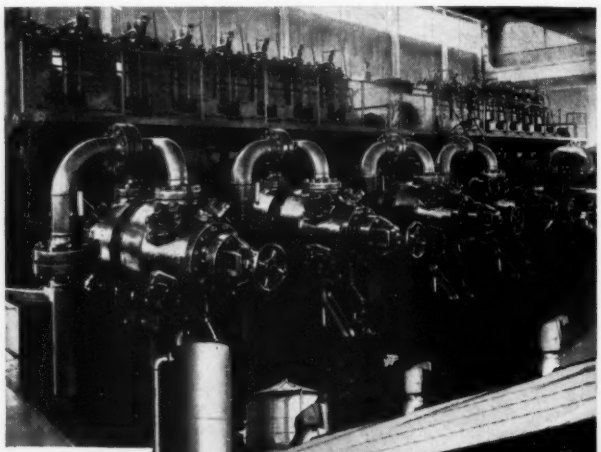

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A DIVISION OF

GRAVER TANK & MFG. CO., INC.

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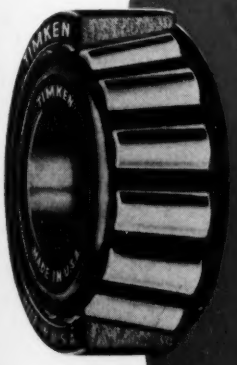
NEW YORK CHICAGO HOUSTON

Engineering Dept.: 880 Bergen Avenue
Jersey City, New Jersey

Ajax CMA engines equipped with Timken bearings on the crankshaft and power take-off are manufactured in various sizes for gas and oil operation. Write to Ajax Iron Works, Corry, Pa., for further information.

DEPENDABLE POWER FOR PUMPING WITH TIMKEN® BEARING EQUIPPED ENGINES



The new line of AJAX CMA oil well pumping engines features Timken tapered roller crankshaft main bearings. Ajax Iron Works, Corry, Pa., selected Timken bearings for these engines because of their consistently satisfactory performance and dependability in Ajax drilling engines and other equipment over a long period of years.

Timken bearings make good engines better by eliminating crankshaft friction and wear; giving full protection against radial, thrust and combined loads; holding the crankshaft in constant alignment; and keeping the crankshaft and adjacent parts in accurate relationship. Thus, engines equipped with Timken bearings require less attention for lubrication and maintenance, yet last longer.

Make sure you have them in the engines you build or buy. Look for the trade-mark "TIMKEN" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address "TIMROSCO".

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DRILLING RIGS

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- ☐ Conditioning drilling mud
- ☐ Drinking water supply
- ☐ Fire protection
- ☐ Washing down drill pipe, etc.
- ☐ Water supply for cementing, etc.
- ☐ Transferring mud between pits
- ☐ Dewatering around rigs
- ☐ Dewatering slush pits

GEOPHYSICAL AND EXPLORATION WORK

- ☐ Jetting shot holes
- ☐ Drilling test holes
- ☐ Filling water tanks on seismograph trucks

PRODUCTION

- ☐ Residue from sumps inside fire walls
- ☐ Oiling down lease roads
- ☐ Tank bottoms to slush pits for disposal
- ☐ Filling tank trucks with water for initial treaters, indirect heaters, radiators, etc.
- ☐ Transferring tanks (leaky tanks, bad oil; for repairs, cleaning, etc.
- ☐ Transferring salt water
- ☐ Cleaning up oil leases line breaks, tank leakage
- ☐ Circulating tank bottoms through treaters
- ☐ Circulating bad tanks through treaters
- ☐ Pumping from tank or treater to slush pit
- ☐ Driving chemical feed pump
- ☐ Draining treater for cleaning
- ☐ Domestic service around lease houses
- ☐ Cleaning B.S.&W. from tanks (heavy)
- ☐ Cleaning B.S.&W. from tanks (light)

PIPELINE OPERATIONS AND MAINTENANCE

- ☐ Cleaning up oil lease
- ☐ Pumping out sumps
- ☐ Removing water from pump houses
- ☐ Dewatering for repairs
- ☐ Salvaging oil in event of line break
- ☐ Transferring tanks in case of leaks
- ☐ Gathering systems (lower pressures)

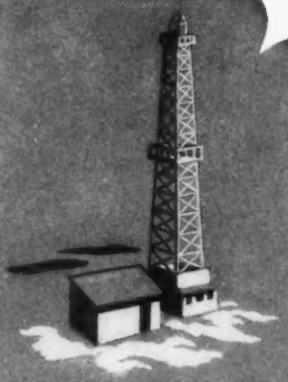
PIPELINE CONSTRUCTION

- ☐ Dewatering
- ☐ Water supply to equipment
- ☐ Washing down equipment
- ☐ Pumping station foundations

REFINERIES

- ☐ Pumping cooling water
- ☐ Pumping out sumps
- ☐ Water transfer
- ☐ General waste pit pumping

What kind of pump does **ALL THESE OIL COUNTRY JOBS?**



MARLOW

It pays to standardize on Marlows for oil country pumping. World's most complete line of self-priming centrifugal pumps. Sizes 1½- to 10-inch; capacities 3,000 to 240,000 gallons per hour. Write for the name of your nearest distributor. Marlow Pumps, Ridgewood, New Jersey, U.S.A.

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LUBE OIL, FUEL OIL, GREASE, GASOLINE

through the use of

GLIDDOL

by Glidden, *Pacemaker in Soya Research*

Many refiners have already discovered how Gliddol—the scientifically processed soybean derivative by Glidden—reduces surface tension to promote the thorough blending of oil or grease and additives. And from the combined evidence of laboratory tests and the experience of users, they report that this ideal blending agent and inhibitor gives greater protection to engine parts by effectively checking oxidation . . . gives oil and grease a longer life of usefulness by dispersing all insoluble solids.

In the role of protective colloid, Gliddol prevents the formation of any precipitate in leaded and unleaded gasoline—retards deterioration on exposure of the fluid to sunlight. Gliddol R, a special Gliddol product, slows up the darkening of fuel oil and reduces the formation of precipitate in the presence of heat.

Expert guidance on the use of Gliddol and Gliddol products to improve your product is offered without obligation by the Technical Service of Glidden—Pacemaker in Soya Research. Your inquiry is invited.

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. . . no waste space, compressor and engine coupled into a single, rigid, permanently aligned unit . . . balanced to reduce wear and increase efficiency!

Lightweight

. . . Portables designed for quick handling to and from the job, stationary units vibrationless.

Easy to start

. . . Just push the built-in electric starter, and the Compressor starts . . . to give you a continuous amount of air.

For these reasons—compactness, lightweight, ease of starting—users of Schramm Air Compressors have said they *like* to operate them.

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Schramm features make them the Air Compressors ideal for your many jobs . . . and the reason they're specified North, East, South and West. Write today for full data.

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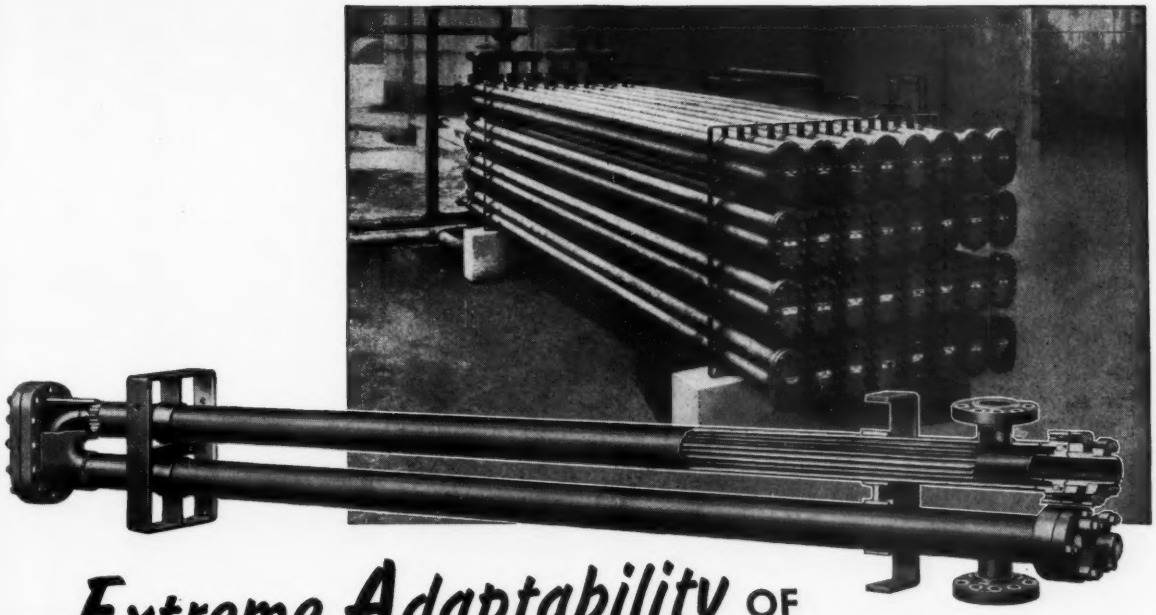
SCHRAMM INC.

THE COMPRESSOR PEOPLE WEST CHESTER PENNSYLVANIA



THE *Extreme Adaptability* OF

BROWN FINTUBE SECTIONAL HAIRPIN HEAT EXCHANGERS

Enables users to keep production abreast of changing market and seasonal conditions

● Unlike "bundle" type exchangers, which are custom built for a definite and fixed duty, Brown Fintube Sectional Hairpin Heat Exchangers give operating men almost unlimited flexibility to meet changing requirements. The capacity of the bank can be increased by adding additional sections to the original installation. Capacity can be decreased by valving off one or more of the parallel streams,—or reducing the number of sections in each stream. The entire bank can be changed from one duty, to another and totally different duty, by remanifolding the sections in different series-parallel arrangement. And the bank can even be disassembled, and the sections then reassembled as two or more smaller exchangers on different duties, in different plants.

Let us help you in adapting Brown Fintube Sectional Hairpin Heat Exchangers—with their many outstanding operating and maintenance advantages—to your next heat transfer requirement. The Brown Fintube Co., Elyria, Ohio. Sales engineers in the principal cities.

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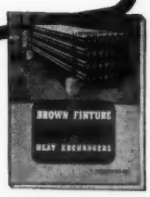
Sectional Hairpin
HEAT EXCHANGERS

1. Flanged Shell Seal and Flanged Union Head End Assembly.
2. Extreme Adaptability to Meet the Requirements of Changed Duties.
3. No Obsolescence.
4. Easy Inspection and Maintenance
5. Continuous Operation. No Shut Downs for Servicing.
6. Minimum Investment in Replacement Parts.
7. The Brown Resistance Welded Integrally Bonded Fintube.
8. Easily Removed Rear End Cover Plate.



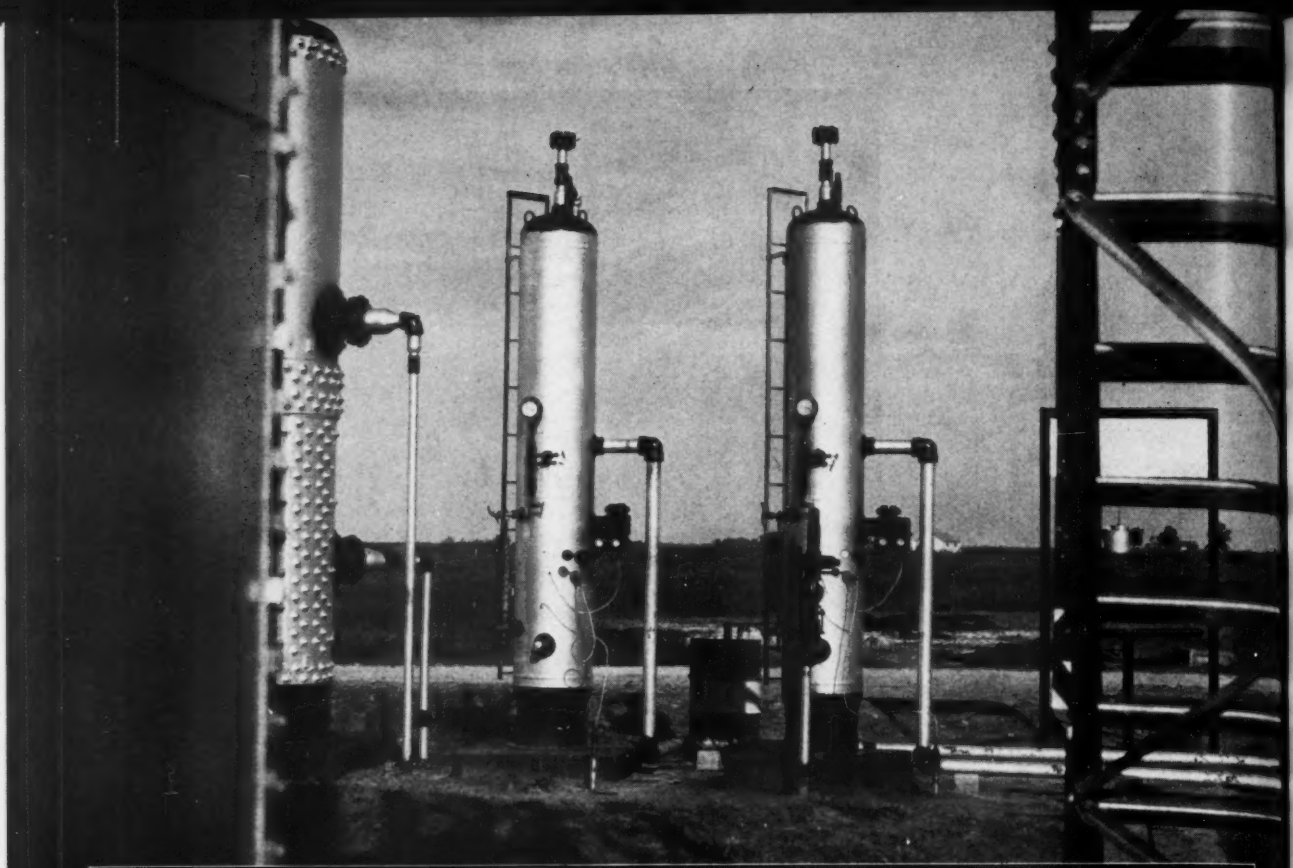
Write today for Bulletin No. 481. It gives full details

BROWN FINTUBE

Sectional Hairpin

HEAT EXCHANGERS

RESISTANCE WELDED INTEGRALLY BONDED FINTUBES AND FINTUBE HEAT TRANSFER PRODUCTS



Here's why Parkersburg Separators stay first choice with many operators

Success of the separating element in Parkersburg Separators is based on the following principles of separation:

1. Centrifugal action of the fluid and gas from the time it enters the separator until discharged;

2. Contraction and expansion of the gas due to increasing and decreasing the velocity while in the separator;

3. The impingement or wiping effect of the gas on the surface of the interior parts as it passes through the separator.

But here are more reasons operators give us for their preference for Parkersburg Separators:

1. Parkersburg has consistently lead the separator field in introduction of new and more efficient control equipment;

2. No other line offers a more complete selection of sizes and types to meet every need and condition.

3. No other manufacturer can offer you more experienced and expert assistance in helping you select the sizes and types to meet your particular requirements.

4. No other manufacturer offers the same brand of field service.

That's why Parkersburg Separators stay first choice with more and more operators year after year. Talk to your Parkersburg Representative about your separating problems.

THE PARKERSBURG RIG & REEL CO.

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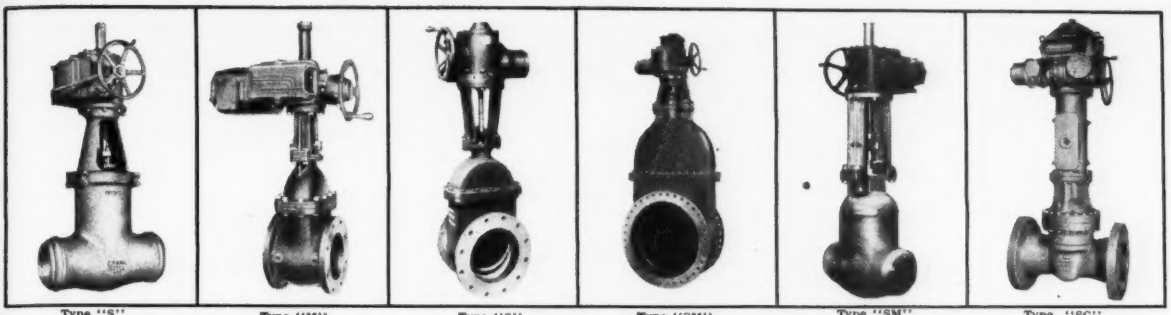
PARKERSBURG



Type "S" LimiTorque on Crane Pressure-Seal Valve

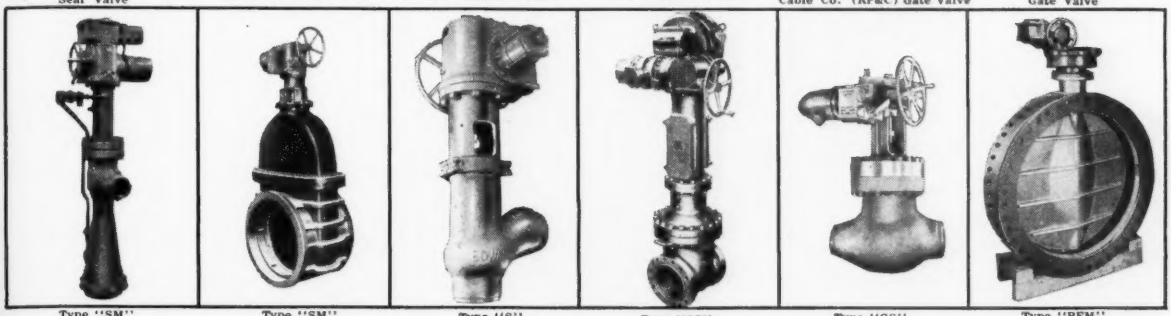
Type "M" LimiTorque on Jenkins Gate Valve

Type "S" LimiTorque on Darling Gate Valve

Type "SM" LimiTorque on Ludlow Gate Valve

Type "SM" LimiTorque on American Chain & Cable Co. (RP&C) Gate Valve

Type "SC" LimiTorque on Crane Venturi Gate Valve



Type "SM" LimiTorque on Schutte & Koerting Reducing Valve

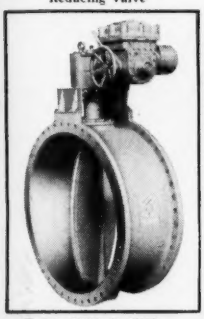
Type "SM" LimiTorque on Rennselaer Inside Screw Gate Valve

Type "S" LimiTorque on Edwards Angle Valve

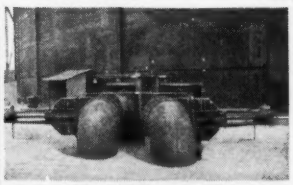
Type "SC" LimiTorque on Powell Gate Valve

Type "GS" LimiTorque on Edwards Boiler Non-Return Valve

Type "BFM" LimiTorque on Phillips (Henry Pratt Co.) Butterfly Valve

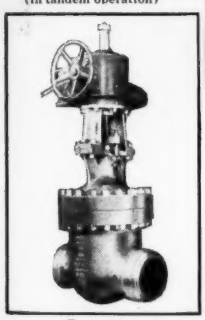


Types "S" & "M" LimiTorque on R-S Butterfly Valve (in tandem operation)



Type "SM" LimiTorque on Chapman 30" & 36" Gate Valves

Type "M" LimiTorque on 24" Iowa Gate Valve



Type "S" LimiTorque on Walworth Valve

Limitorque

MOTOR-OPERATED VALVE CONTROLS

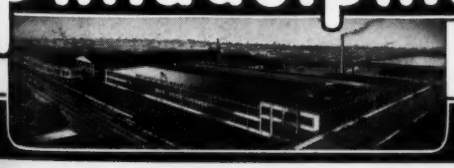
. . . are widely used on many different makes of valves

"*LimiTorque*" operates by the "push of a button," from either remote or nearby control panel . . . prevents damage to stem, seat, disc, gate or plug, because the Torque Seating Switch limits the torque, and thereby, shuts-off the motor, *before* trouble can occur. Thousands are in daily use on land and sea.

LimiTorque Controls may be obtained through Valve Manufacturers.

There's a Reason for Such Widespread Acceptance

Philadelphia Gear Works, INC.



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AIR AS YOU WANT IT!

For air or gas delivered as you want it, in controlled volumes through 100,000 cfm, against constant or varying pressures —call upon De Laval.

De Laval blowers, compressors and exhausters are made in a wide range of sizes, both single and multi-stage for either constant or variable speed drive, the latter of which can be furnished by steam turbine, variable speed coupling, or DC motor.

For information concerning the compression and flow of air and gases, write for Catalog F.

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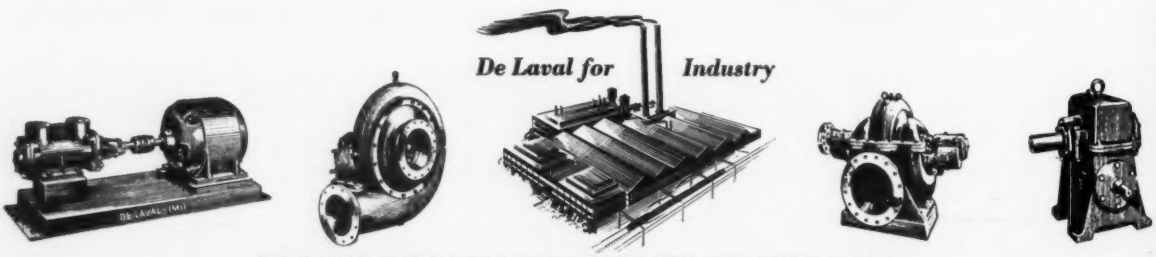

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C-10

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS • CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS AND COMPRESSORS • IMO OIL PUMPS

THE *New* GUIBERSON TYPE J DRILLING HEAD

with FULL-FLOATING WASHPIPE

Increased load-carrying capacity... the ideal tool for drilling-in, reverse circulation and clean-out operations.

Check these improved features!

WASHPIPE PACKING ASSEMBLY IS TAMPER-PROOF

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NO ADJUSTMENT REQUIRED AT ANY TIME

•

ROTATION IS IN EITHER OR BOTH PACKINGS FOR LONGER PACKING AND WASHPIPE LIFE

•

NO MUD OR DRILLING FLUID CAN ENTER HOUSING

•

REINFORCED HEAD WILL NOW HANDLE TUBING STRINGS UP TO 8,000 FEET IN DEPTH

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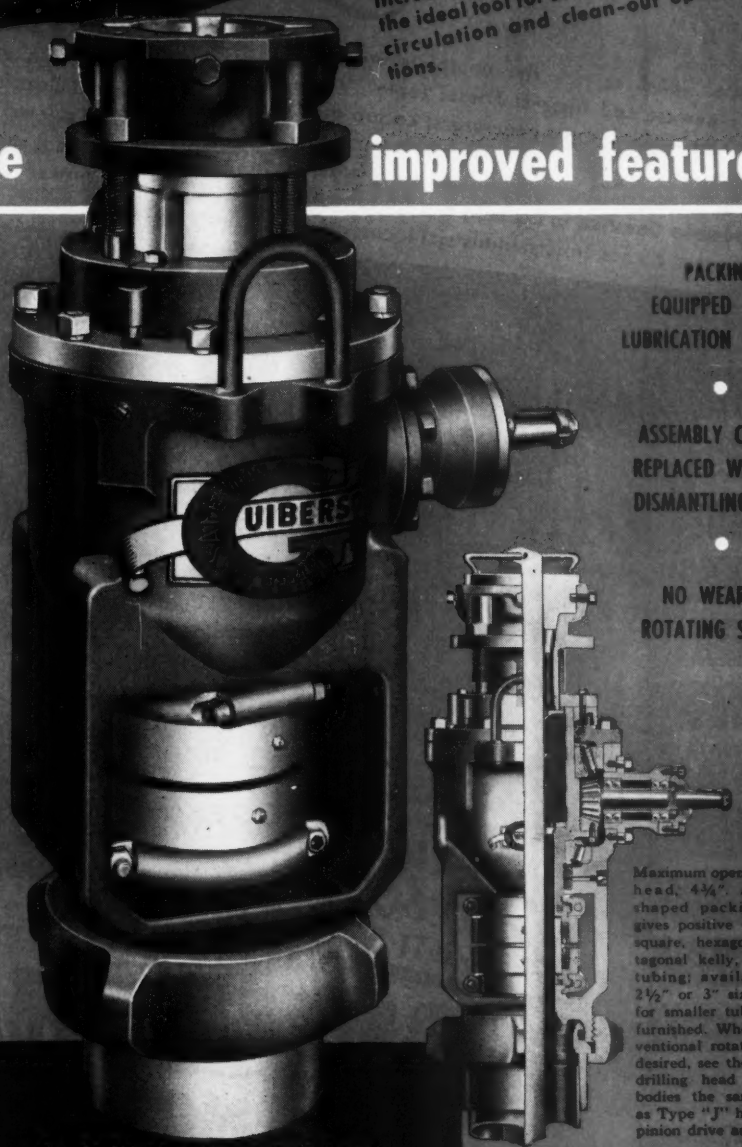

PACKINGS EQUIPPED WITH LUBRICATION FITTINGS

•

ASSEMBLY CAN BE REPLACED WITHOUT DISMANTLING HEAD

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NO WEAR ON ROTATING SPINDLE

Maximum opening through head, 4¾". Accordion-shaped packing rubber gives positive seal around square, hexagonal, or octagonal kelly, as well as tubing; available in 2", 2½" or 3" sizes; rubbers for smaller tubing can be furnished. Where the conventional rotating head is desired, see the Type "K" drilling head which embodies the same features as Type "J" head without pinion drive and gear.

For detailed information on the Guiberson Type J Drilling head, write or call the Guiberson office nearest to you.

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THE GUIBERSON CORPORATION

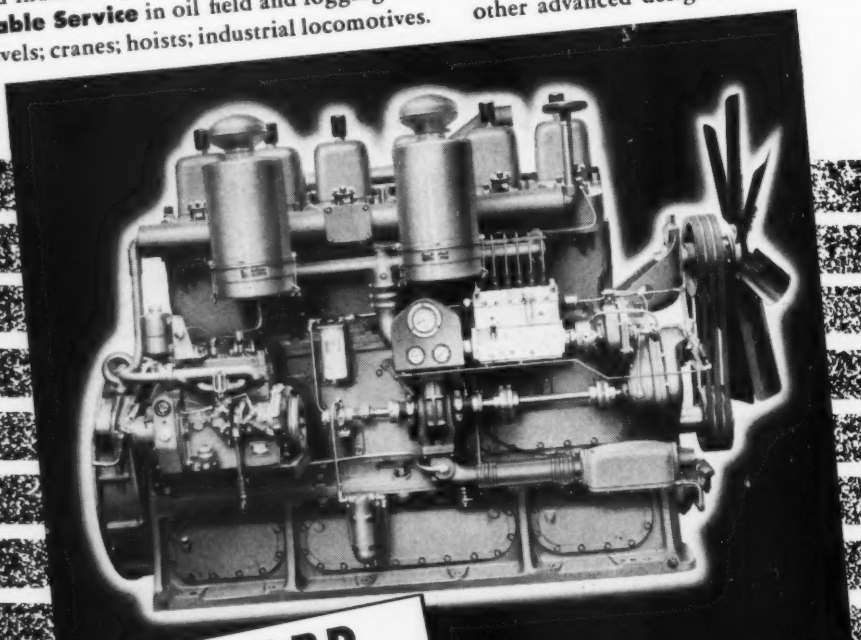
DALLAS, TEXAS ESTABLISHED 1919

It's NEW! Send for it!

Bulletin No. 1454 carries the complete story of Waukesha's newest and biggest Diesel for—
Stationary Duty in pumps; generators; cotton gins; mine, quarry and gravel plant equipment; air compressors; and industrial power plants of every type.
Semi-Portable Service in oil field and logging machinery; shovels; cranes; hoists; industrial locomotives.

Waukesha 6-LRD Diesel Engine has 6 cylinder, 8½ in. bore x 8½ in. stroke, 2894 cu. in. displacement . . . patented clean-burning combustion chamber, removable wet sleeve cylinders, rugged 7-bearing graphitic steel crankshaft, American Bosch injection system, high power gasoline starting engine, and other advanced design features. Get the whole story.

Ask for Bulletin 1454



6-LRD Diesel Six HEAVY-DUTY ENGINE

WAUKESHA Diesel ENGINES

BULLETIN No. 1454

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TIMKEN CARBON STEEL TUBING
Generally for service not exceeding 900°F., where corrosion and oxidation resistance are not important.
TIMKEN CARBON-MO STEEL TUBING
For temperatures up to 1000°F. Improved creep strength makes it safer than carbon steel.
TIMKEN DM STEEL TUBING For service up to 1150°F. This steel offers outstanding creep strength.
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For service up to 1200°F. where better scale resistance is required than can be obtained with 2% Cr. ½% Mo. Steel.
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TIMKEN SICROMO 3 STEEL TUBING
For service up to 1200°F. Has excellent oxidation resistance and good corrosion resistance.
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For service up to 1200°F. Superior corrosion resistance. Less oxidation resistance than Sicromo 3.
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For oxidation resistance to 1500°F. Good creep strength and corrosion resistance to 1200°F.
TIMKEN SICROMO 7 STEEL TUBING
For applications requiring better corrosion resistance than can be obtained with 5% Chromium type steels.
TIMKEN SICROMO 9 M STEEL TUBING This steel possesses the maximum corrosion resistance of any of the steels below the stainless group.
TIMKEN 18-8 STEEL TUBING Shows the best combination of creep strength, oil corrosion resistance and oxidation resistance up to 1500°F.

Here's your yardstick for a better LIFE/COST ratio for your tubes

BUYING high temperature tubes that are more expensive than you need can be just as poor business as buying tubes that fail rapidly and require too frequent replacement. There is only one yardstick to measure true value: Which tubes will give the best life/cost ratio for your particular conditions?

Here are 12 of the high temperature steels developed by The Timken Roller Bearing Company to solve a wide range of specific problems of heat, pressure, corrosion and oxidation. One of these steels has the correct combination of properties to give you the exact service you need—at the lowest cost in terms of useful life per dollar invested.

Look over the tubes listed at left. Then take advantage of the long experience of Timken's Technical Staff to help you choose the right analysis for your particular job. Once a suitable steel has been selected, you can be sure of the same uniform high quality with every order you place. That's because Timken rigidly controls every step from melting right through to final tube inspection.

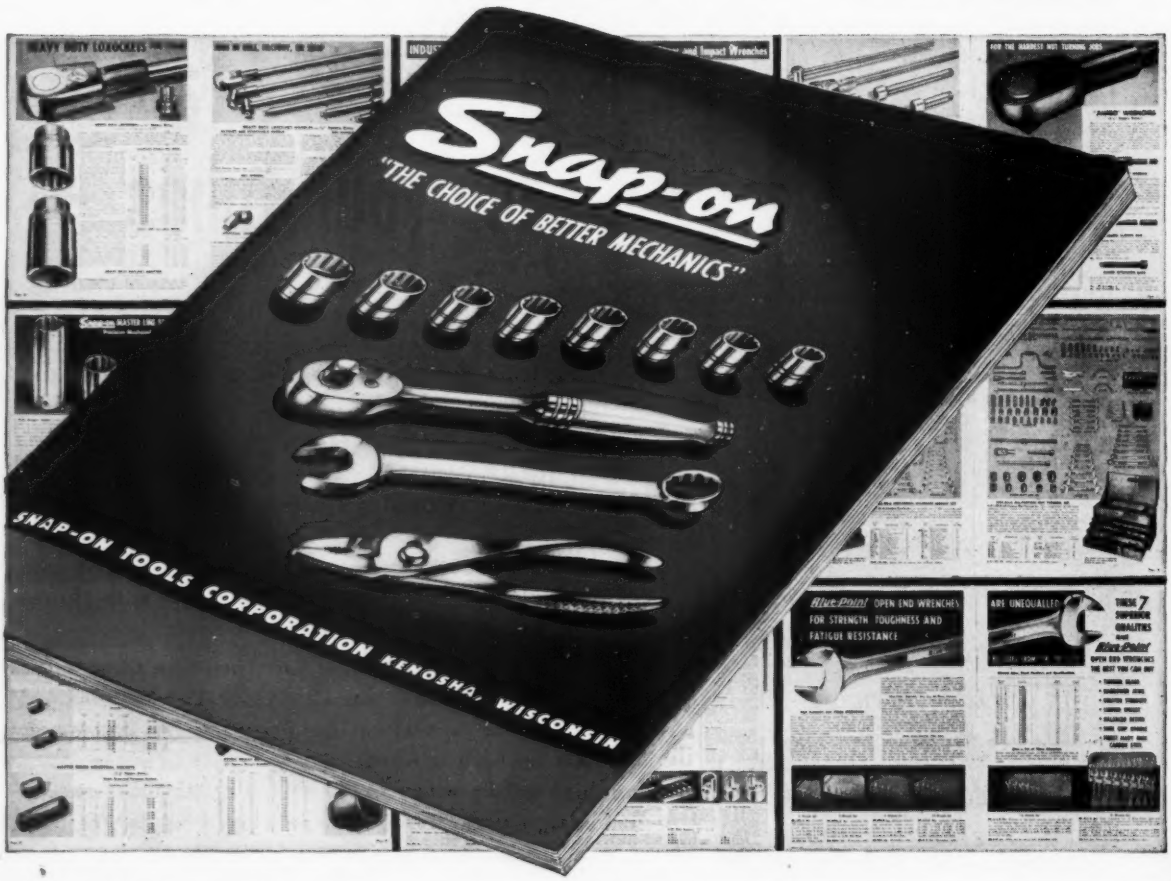
Write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.

The New Snap-on Catalog

of Mechanics' Tools now ready for distribution



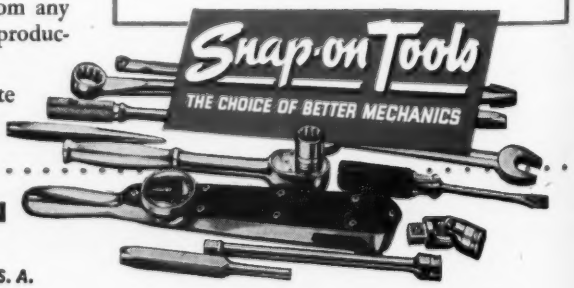
Send for your copy today!

It's new! It's factual! It shows the complete line of Snap-on mechanics' tools in sets and as individual pieces! It gives you sizes, construction and special features! It illustrates and describes many reasons why Snap-on tools are the choice of better mechanics everywhere!

There are 5 reasons why Industrial firms find it pays to use Snap-on tools throughout their plants. (1) Quality is the finest possible. (2) Widest range available from any one source. (3) Personalized service that only Snap-on can render. (4) Prompt shipment from any one of 40 factory warehouses. (5) Facilities for quantity run production of special tools.

Write for this and other special catalogs showing complete line of industrial sockets for power and impact wrenches.

Branch Sales Offices Located in 40 Principal Cities Provide Snap-on Service to all important Industrial areas



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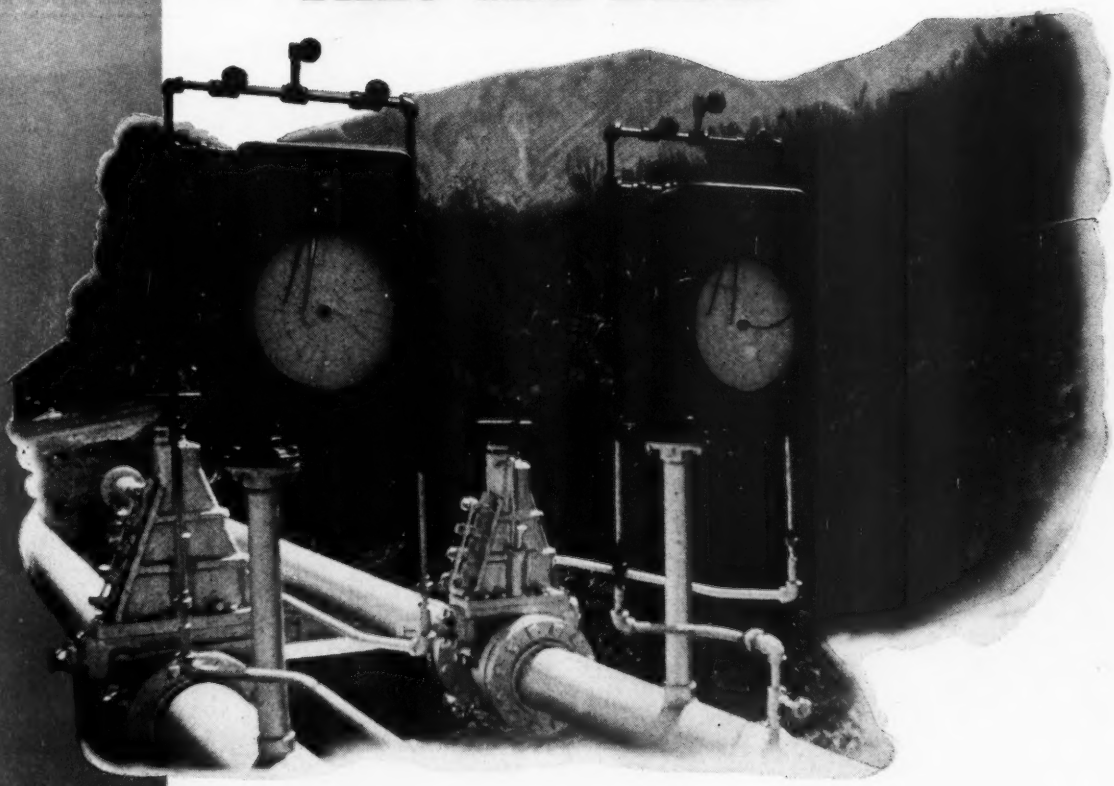
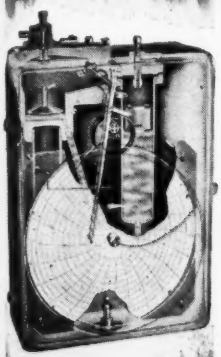
Where Low-Cost Accuracy Saves Time and Labor





OUT IN THE FIELD, where maintenance is infrequent and tough conditions call for dependable measurement, you'll find that METRIC American Orifice Meters pay off in low-cost accuracy.

When adjustment becomes necessary, simple, functional design makes this quick and easy. Only three tools — screw driver, wrench and pliers are needed.

The fewest possible moving parts go into METRIC American design — only one part between the mercury and the chart record. The float is simply constructed — placed on the low side to make calibration easy. Meters can be cleaned without upsetting adjustment — adjusted without interference with working parts.

METRIC American's low-cost accuracy and easy-to-service design, proved the world over, are the result of years of measurement engineering.

Technical literature, on Indicating, Recording or Integrating Flowmeters, Pressure Regulators, Liquid Level and Flow Controllers will be mailed on request.

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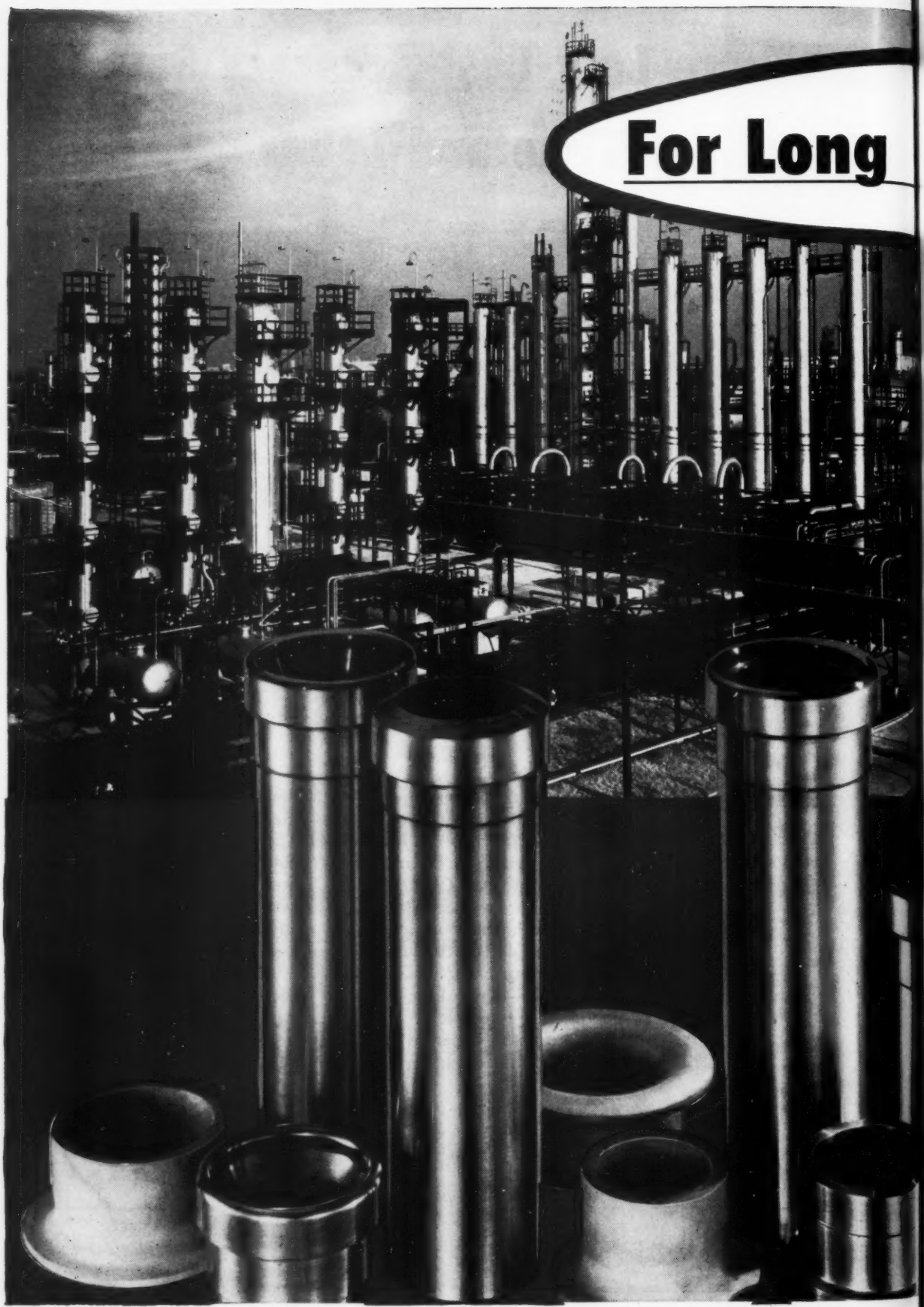
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Dependable Service

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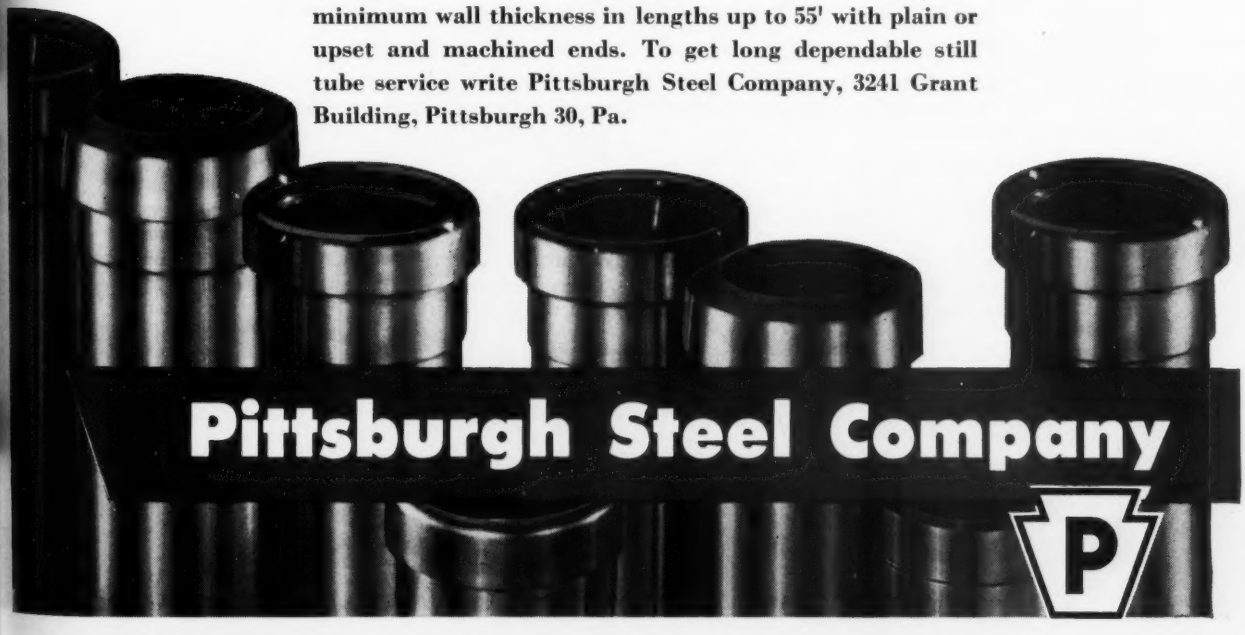
Pittsburgh Still Tubes

You get long dependable service when you install Pittsburgh Still Tubes in your refinery equipment. They are produced especially to resist the severe heat, pressure and corrosive action of your operations—with economy. Numerous grades of alloy steels ranging from low molybdenum and intermediate chrome-molybdenum alloys to the higher grades—including stainless have been developed to meet your problems of creep strength corrosion and oxidation.

In order to take full advantage of the wide range of analyses, sizes and wall thickness available, our metallurgical engineers will be glad to work with you in specifying the proper tubes for your next installation. Pittsburgh Still Tubes are made in sizes from 2" to 6" outside diameter (in some cases even larger) from .134" to 1" average or minimum wall thickness in lengths up to 55' with plain or upset and machined ends. To get long dependable still tube service write Pittsburgh Steel Company, 3241 Grant Building, Pittsburgh 30, Pa.



View of Oceco 3" Screwed Connection Vent Valve with Flame Snuffer and Chain.

OCECO

V-113 VENT VALVES

for maximum efficiency, economy and dependability

View of Oceco 6" Flanged Connection Vent Valve showing mounting on Oceco Flame Arrestor.

● Oceco Vent Valves provide positive and dependable control of tank breathing. They prevent the free discharge of vaporized liquids resulting from fluctuations in temperature,—and restrict tank breathing, resulting from pumping into a tank. They avoid any serious lowering of gravity ratings;—retard the formation of gum;—and avoid "cave-ins" and "blow-outs" resulting from excessive vacuum and pressure.

These valves combine the advantage of our twenty five years of experience in meeting the industry's most exacting requirements;—and the results of exhaustive tests conducted in our laboratories. The Venturi effect of the body gives the valves even greater pressure capacity than an open nipple, while the spacing and design of the openings provides large vacuum relief. The drip edges on the valves carry away any condensate, thus protecting the valves against corrosion and freezing, and the stem guided construction prevents sticking and "cocking."

The housings are semi-steel castings that can withstand direct exposure to flames for long periods of time, and consequently provide a solid support for the valves, valve guides and seats, keeping them in proper alignment and assuring tight closure at all times.

Furnished in 2" and 3" sizes for screw mounting, and 4", 6", 8", 10" and 12" sizes for flange mounting, either as individual units or complete with an Oceco Flame Arrestor. Prices and a fully descriptive bulletin sent promptly on request.

OCECO

Division of THE JOHNSTON & JENNINGS CO.

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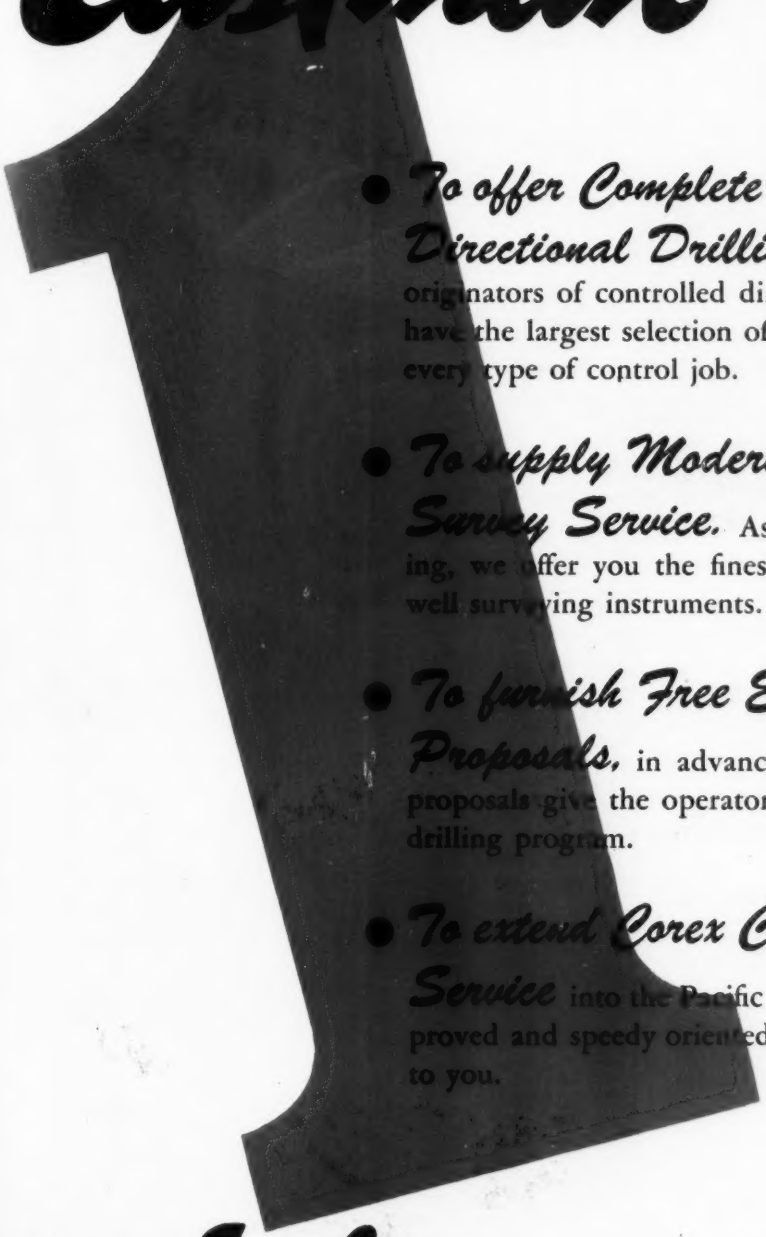
NEW YORK • PITTSBURGH • DETROIT • CHICAGO • ST. LOUIS • TULSA • BEAUMONT
MOBILE • CASPER • SAN FRANCISCO • LOS ANGELES • TORONTO AND MONTREAL

Eastman First!



- **To offer Complete Controlled Directional Drilling Service.** We are the originators of controlled directional drilling service, and have the largest selection of patented deflecting tools for every type of control job.

- **To supply Modern Oil Well Survey Service.** As pioneers in oil well surveying, we offer you the finest and largest selection of oil well surveying instruments.

- **To furnish Free Engineering Proposals,** in advance of directional work. These proposals give the operator valuable aid in planning his drilling program.

- **To extend Corex Core Orientation Service** into the Pacific Coast and Gulf Coast areas. A proved and speedy oriented core service is now available to you.

Call Eastman first! 22 OFFICES TO SERVE YOU

EASTMAN OIL WELL SURVEY COMPANY

DENVER • LONG BEACH • HOUSTON

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Export Office: 2895 Long Beach Blvd., P. O. Box 408, Long Beach, California

Paranite—G.O.P. Oil Loading Hose has 7 distinct features that provide faster, safer, cleaner service for either suction or discharge.

Manhattan made the first absolutely oil-proof Oil Loading Hose by developing the FLEX-LASTICS – G.O.P. (Gas-Oil-Proof) inner tube that won't deteriorate or swell. Even the earliest installations of Paranite Oil Loading Hose lasted for years and have never been surpassed for efficiency.

The scientific construction and reinforcement of Paranite insures a full orifice for fast delivery under all conditions . . . and easier, faster hook-ups between ship and shore.

There is no chance for hose leakage because Manhattan's Type "C" Leak-Proof Fittings are inseparably built into the hose wall. No trouble-some outside bands or projections.

Paranite is also made in heavy duty, smooth bore, sea loading and barge types... Send today for your new copy of Bulletin 6806-B containing complete data.

It pays to buy "all-Manhattan"—hose, belts and other rubber products for refineries and oil rigs.

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RAYBESTOS-MANHATTAN INC.

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MANHATTAN RUBBER DIVISION **PASSAIC, NEW JERSEY**

The customer knows what he wants . . .

a complete petroleum refinery

process units—tankage—maintenance shops—loading and unloading facilities—sewerage—administration and laboratory buildings—gas and [illegible]—storage—packaging and barreling facilities—tank car and tank truck loading racks—process steam and power—cooling water systems—cooling towers, etc.

design

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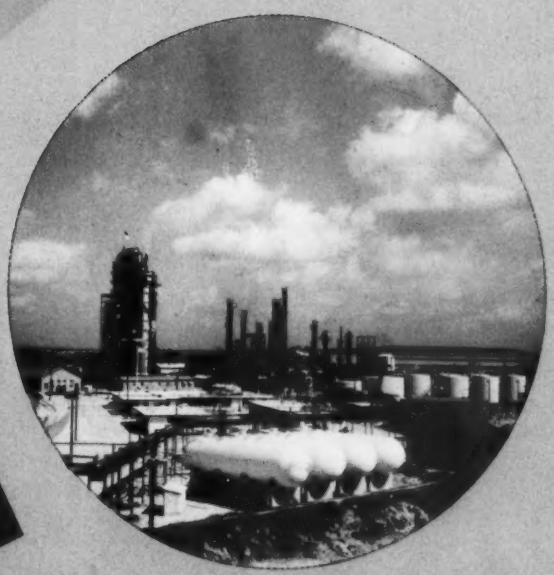
fabrication

construction



The customer gets what he wants . . .

when his experience and knowledge is joined with that of an engineering service which has built over 400 process units . . . complete refineries and chemical plants.

Collaboration pays off—in time and money.

FOSTER WHEELER CORPORATION

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one . . . complete . . . engineering and construction service

complete petroleum
refineries and
chemical plants

one contract
one contractor
one constructor

FOSTER WHEELER CORPORATION
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Cummins Diesels Save Fuel

Compare the cost! **Operate a Cummins Diesel alongside other engines—diesel, gasoline, or butane—then check your fuel bills. Here's what our customers report:**

Annual Savings: $2626.50

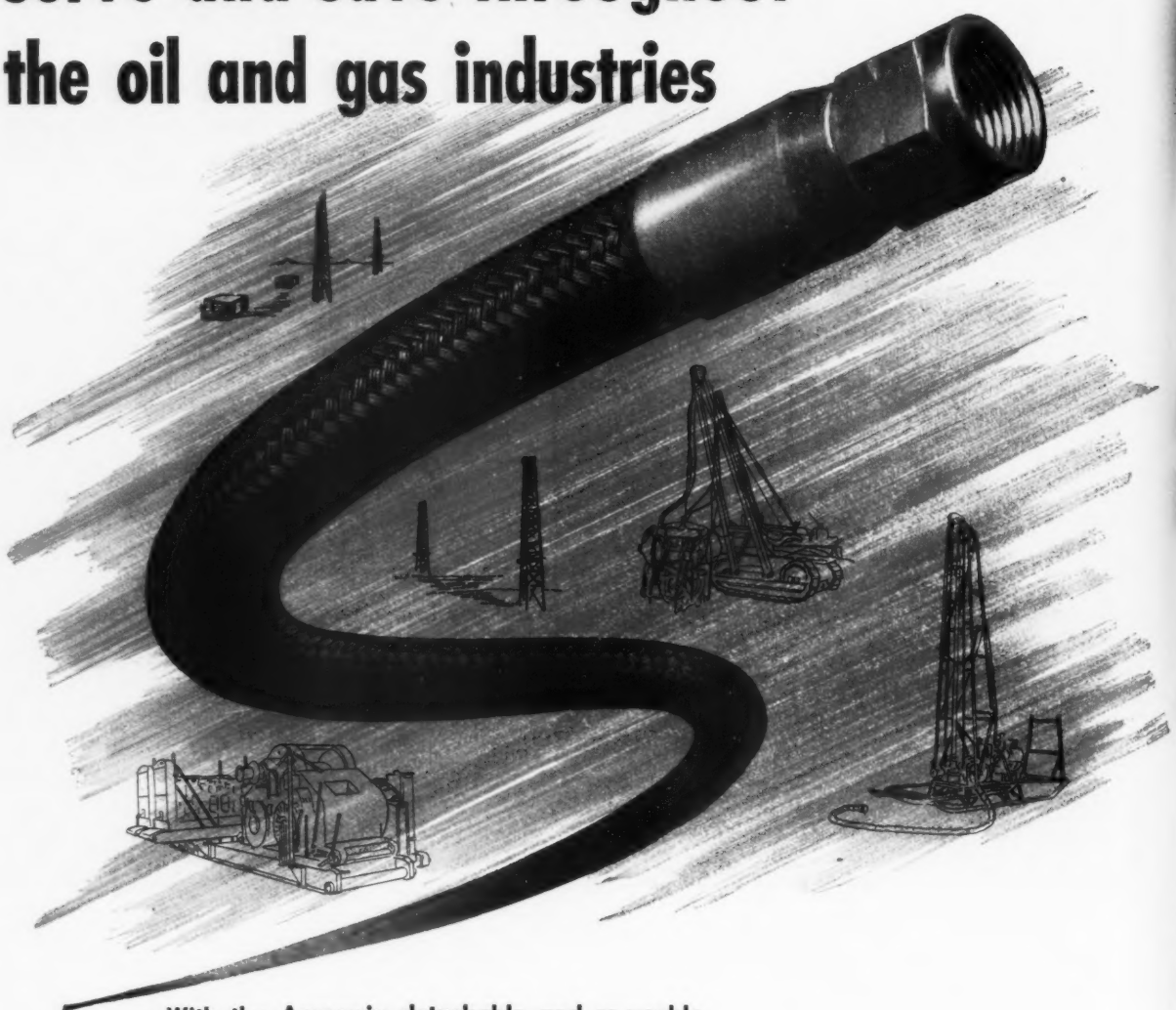
Yearly fuel costs for a Cummins-powered tractor used on a 750-mile round trip highway haul are $2626.50 less than the fuel costs for a gasoline-powered unit on the same run. That's because the Cummins-powered rig, while hauling 7000 pounds more each trip, operates at a ton-mile cost of 1.84 mills against 3.45 mills for the gas job.

Annual Savings: $1138.80

Yearly fuel costs for a Cummins Diesel on an off-highway hauling job are $1138.80 less than the fuel costs for a unit powered by another make of diesel doing similar work. That's because the Cummins-powered unit, while making more trips and carrying heavier loads, uses 25.7 gallons of fuel per shift against 33.5 gallons per shift for the other diesel.

CUMMINS ENGINE COMPANY, INC. • COLUMBUS, INDIANA

AEROQUIP FLEXIBLE HOSE LINES serve and save throughout the oil and gas industries



With the Aeroquip detachable and re-usable fitting, service and repair are quickly accomplished in the field or on the job and lost time for valuable equipment is kept to a minimum. Reliable operation at high or low temperatures. Eliminate failures due to vibration and prevent leakage.

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AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

YOU CAN DRILL

LANE-WELLS BRIDGING PLUGS in 2 to 4 hours

LANE-WELLS SERVICES available through Petro-Tech Service Co., Maracaibo; Venezuela Oil Field Service Co., Caracas; Trinidad Oil Field Services, Ltd., San Fernando

with these tested Operations!

Lane-Wells asked the manufacturers* of rock bits to determine the best method of drilling Bridging Plugs. These manufacturers have chosen their own bits and in cooperation with Lane-Wells engineers developed a 4-point plan of operation designed to save oil well operators time and trouble. Experience proves that in most cases the Plugs can be knocked down the hole in approximately two hours or completely drilled up in two to four hours.

Ask your Lane-Wells representative how you can save time and money in testing and plug-back operations by using Lane-Wells Drillable Bridging Plugs.

PRECAUTIONS:

a) Always use a new bit.

b) Choose bit size to provide minimum clearance between casing and bit.

c) Start with a light weight to avoid chipping bit teeth early in the drilling operations. Feed as recommended.

d) Alter rotating speeds as recommended.

e) Avoid impact in applying weight and percussive action during the drilling operation.

DRILL-OUT INSTRUCTIONS

1 Initial bit weight should approximate 1500# to 2500# while drilling the first five inches of plug. Rotary speed should be about 50 r.p.m.

2 After five inches of penetration, increase the Rotary speed and bit weight as follows:

Security Type CF-10 Model 45 (4-5/8")	12,000#	50 r.p.m.
Hughes Tool Co. — W-7R (4-3/4")	15,000#	60 r.p.m.
Reed Tool Co. SE-2C (6-1/4")	15,000#	60 r.p.m.
Security Type CFF-13 Model 45 (6-1/8")	12,000#	50 r.p.m.

3 After penetrating 10" to 12" into the plug, this includes the 5" mentioned above, change weight or speeds as follows:

Security Type CF-10 Model 45 (4-5/8")	12,000#	100 r.p.m
Hughes Tool Co. — W-7R (4-3/4")	10,000#	60 r.p.m.
Reed Tool Co. — SE-2C (6-1/4")	15,000#	60 r.p.m.
Security Type CFF-13 Model 45 (6-1/8")	12,000#	100 r.p.m.

4 Continue this weight and speed following the plug as it moves down the hole. Generally speaking the plug drills as follows, with a new bit:

1st 6 inches — fast
2nd 6 inches — fast
3rd 6 inches — medium fast
4th 6 inches — fast
5th 6 inches — slow
for plugs — "Get it! Set it! Forget it — or Drill it!

* Information and data on other bits will be released as soon as available.

Tomorrow's Tools - Today!

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LOS ANGELES • HOUSTON • OKLAHOMA CITY
24 HOUR SERVICE — *General Offices, Export Offices and Plant* — 45 BRANCHES
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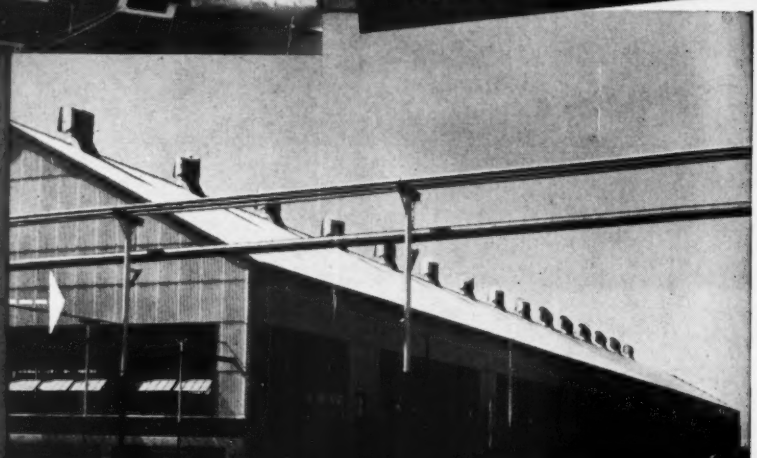
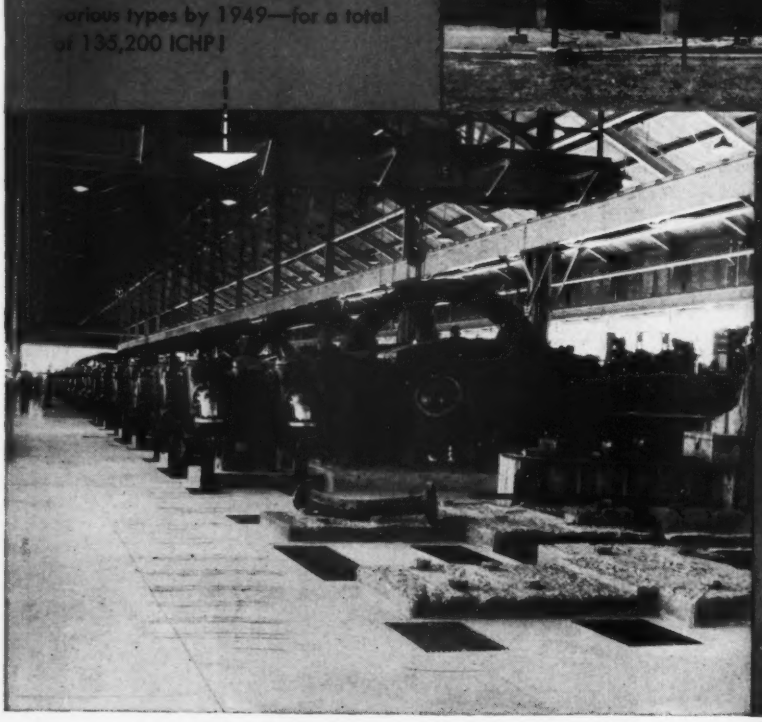
Leading

WORTHINGTON HORIZONTAL GAS ENGINE COMPRESSORS WILL TOTAL 135,200 ICHP

Photos taken at one of the country's largest compressor stations — the Stinnett, Texas, plant of the Texoma Natural Gas Company, a company affiliated with the Natural Gas Pipeline Co. of America. Interior views show Worthington Horizontal Gas Engine Compressors (24" x 36", Twin Tandem, 1400 HP each) in process of installation. Starting with 37 of these in 1931, the company will have 104 Worthington units of various types by 1949—for a total of 135,200 ICHP!





Worthington "Angles"

Throughout the oil and gas industries Worthington LTC Angle Gas Engine Compressors are famous for cost-saving, uninterrupted gas-transmission. In refrigeration, and in chemical and other processes as well, this ability of LTC's to carry full loads "around the clock" is proving to a wide range of users that *there's more worth in Worthington* . . . Five sizes of cylinder combinations, 400 to 1000 HP. Write for Bulletin L-690-B1.

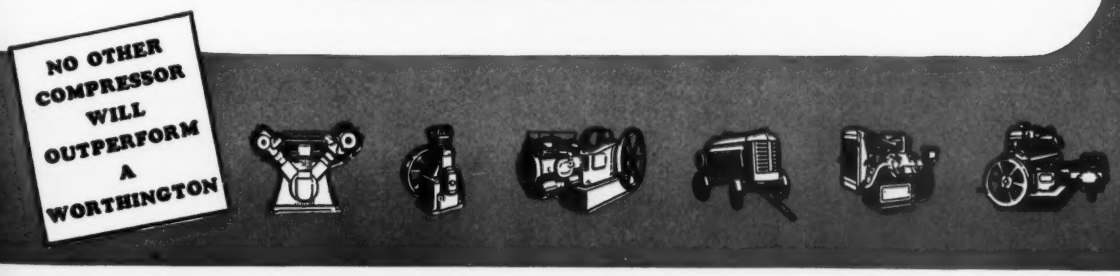
pipeline company adds **ANOTHER** *Worthington mass-installation!*

The Natural Gas Pipeline Company of America, since its formation in 1931, has made Worthington units key factors in an outstanding expansion program. By 1949, this will include a line-capacity of 484 million cu. ft. per day—almost triple the original volume!

Case histories like this—and Worthington can show you plenty of them—point to facts vital to every user of power or compressor service. Such reorders for multiple installations can only come from complete confidence—based on years of "living with" Worthington equipment, checking continuously on its dependability and economy, comparing it with competitive units.

That's why it will pay you—whether you need one engine or a battery of them—to look further into the many advantages of Worthington Horizontal Gas Engine Compressors. Write for information. *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.*

WORTHINGTON



FOR OVER 50 YEARS

From the time Samuel M. Jones introduced the first all-metal iron sucker rod, this familiar brand has been the favorite of men who demand its rugged dependability.

The modern durable green rods in use today incorporate every improvement gained through experienced knowledge of more than half a century. It's on the record that Jones has led the way in sucker rod research design and manufacture. When you specify and buy these green rods, you get the best. Top performance is assured as it has been for all rods bearing our brand for over 50 years.

JONES SUCKER RODS

LOOK FOR THE GREEN RODS

● *Your copies of "Care and Handling of Sucker Rods" and the New Snap-Tite Wrench Folder will be sent on request.*

★ **THE S. M. JONES COMPANY**
(Subsidiary of Buffalo Bolt Company)
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Sales Office: McBirney Building, Tulsa, Okla.
Export Sales Office: Buffalo International Corp.
50 Church Street, N. Y. C.

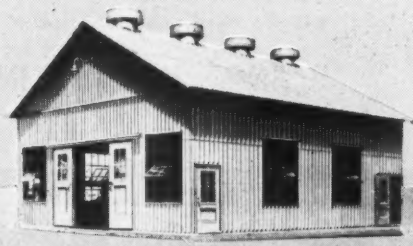
COLUMBIAN STEEL TANK COMPANY
MANUFACTURERS
"TANKS FOR THE WORLD"
KANSAS CITY, MO. U.S.A.

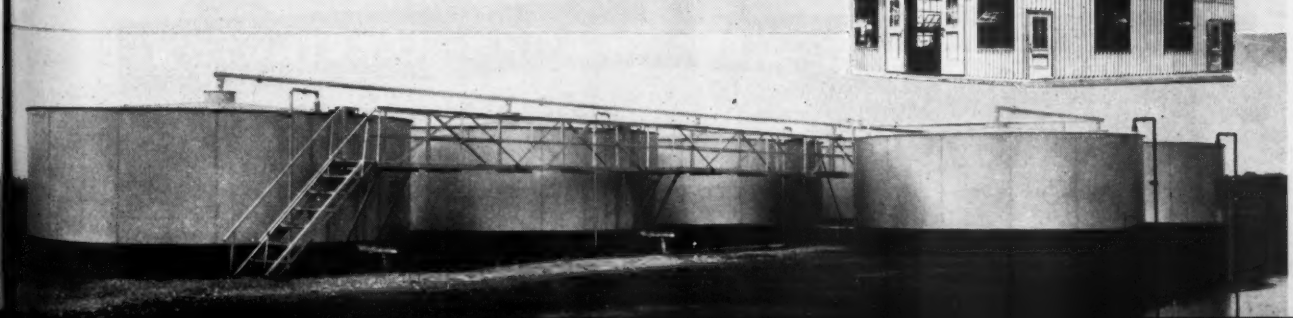
COLUMBIAN STEEL TANK CO. K.C. MO.
COP-NIC
COPPER-NICKEL ALLOY
TANKS FOR THE WORLD

COLUMBIAN
BOLTED STEEL TANKS

The Columbian Trade Mark is internationally known as a dependable guide to bolted steel tanks that give extra value in long-life, economical storage service in oil fields all over the world. Precision engineered from top quality steel, Columbian Tanks provide easy assembly. You'll like the many exclusive construction features. Columbian Bolted Steel Tanks are available now for oil producers. Columbian COP-NIC Tanks, especially for sour crude, will be available when conditions permit.

★ Columbian All-Metal Buildings are ideal for warehouses, engine houses, garages, equipment and storage houses. Rigid, strong, fire-safe, low upkeep.





COLUMBIAN STEEL TANK CO.
P. O. Box 4226-H Kansas City, Missouri

Miracle on Wheels

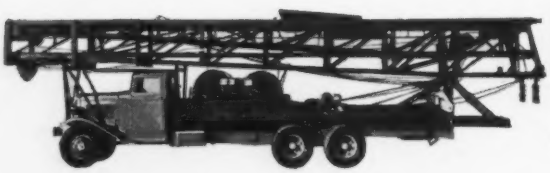
Sand Dunes—deep mud or snow—steep hills or mountain grades . . . all are one and the same to Marmon-Herrington *All-Wheel-Drive* Trucks.

Marmon-Herrington *All-Wheel-Drive* Trucks give you tremendous tractive power—*where you need it, when you need it.* With front wheels pulling, rear wheels pushing, these great trucks are "made-to-order" for really tough trucking jobs—jobs too difficult or altogether impossible for trucks of conventional drive.

In Marmon-Herringtons you will find the world's most complete line of *All-Wheel-Drive* trucks. There are several regular models—both 4-wheel-drive and 6-wheel-drive—with G.V.W. up to 42,000 pounds. In addition, Marmon-Herrington converts all standard Fords to *All-Wheel-Drive*—available in a wide range of 4-wheel-drive and 6-wheel-drive models, with G.V.W. from 4,700 pounds to 35,000 pounds.

Get the complete facts on these great *All-Wheel-Drive* trucks. Ask your nearest Marmon-Herrington dealer for an on-the-job demonstration of their amazing performance ability, or write direct for illustrated literature.

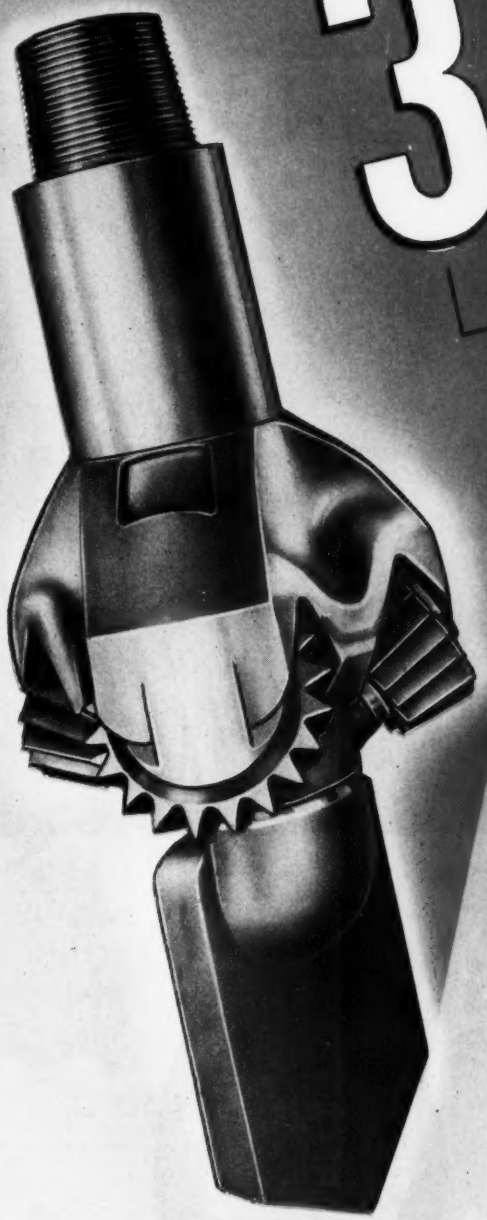
MARMON-HERRINGTON COMPANY, INC., INDIANAPOLIS 7, INDIANA



MARMON-HERRINGTON

All · Wheel · Drive

3 IMPORTANT ADVANTAGES



- *true round holes*
- *smooth operation*
- *long cutter life*

In CP Type C Reaming Bits, three-hard faced cutters, mounted on roller bearings, are welded in cutter pockets of the ruggedly constructed, one-piece head. Cutter units for use on remote wildcat wells can easily be replaced by any competent welder. Replaceable pilot blades are readily adaptable to any size pilot holes.

Type C Reaming Bits are available in sizes 11" to 24". The Bit shown in the illustration is 17¼" with 11" pilot.

Prompt service is assured in the Mid-Continent and Rocky Mountain fields.

CHICAGO PNEUMATIC TOOL COMPANY

MANUFACTURED AT FRANKLIN, PA.

GENERAL & EXPORT OFFICES: 6 EAST 44th STREET, NEW YORK 17, N. Y.

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always at hand.

TRET·O·LITE service

Tretolite service is *available, right now.* Wherever your lease, whatever your problem, a phone call will bring you a Tretolite Service Engineer, and quickly. Tretolite Service Engineers are located to provide maximum service for *every field.* The next time you have an emulsion problem, get the best assistance available – call Tretolite.

TRETOLITE COMPANY

Manufacturing Chemists

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DEHYDRATING | DESALTING

T-48-8

POWELL makes a *complete* line of valves designed for OIL REFINERIES

More than a hundred years ago Powell adopted a policy. This was to make valves *only* and to make *every kind* of valve that industry might require.

And through the years, strict adherence to this policy has built such a complete line of valves that today there's a Powell Valve for every known industrial flow control service. This includes Bronze and Iron Valves of all required types and designs; Cast Steel Valves of all types in pressure classes from 150 to 2500 pounds; and Corrosion Resistant Valves—including many special designs—made in the widest variety of metals and alloys ever used in making valves.

The Wm. Powell Co., Cincinnati 22, Ohio

DISTRIBUTORS AND STOCKS IN ALL PRINCIPAL CITIES

Fig. 1460—125-pound Iron Body Bronze Mounted or All Iron "Master Pilot" Gate Valve.

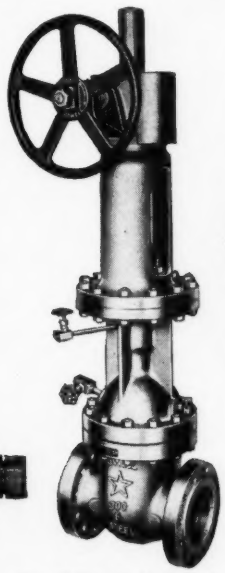


Fig. 3003 S. S. Mod. — Class 300-pound Cast Alloy Steel Gate Valve for ultra high temperatures as in T. C. C. Has drain valves in stuffing box and bonnet. Also cooling fins to dissipate the heat. Gear operated.

Fig. 1793—Large 125-pound Iron Body Bronze Mounted O.S. & Y. Gate Valve.

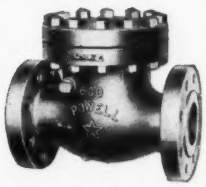


Fig. 6061—Class 600-pound Cast Steel Swing Check Valve.

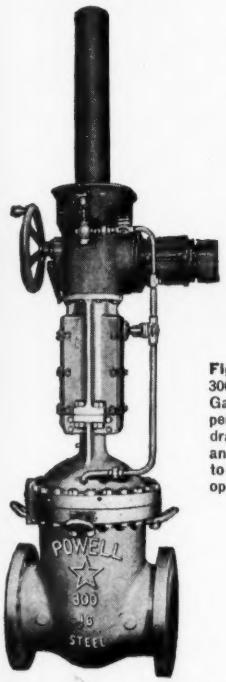


Fig. 3023—Class 300-pound Cast Alloy Steel Gate Valve with automatic steam sealing mechanism. Has explosion proof electric motor operator.

Fig. 375 — 200 - pound Bronze Gate Valve with renewable "Powellium" nickel-bronze disc.

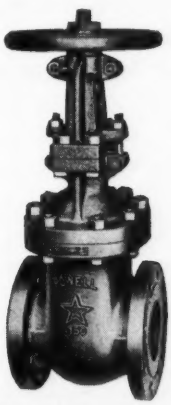


Fig. 1503—Class 150-pound Cast Steel O.S. & Y. Gate Valve.

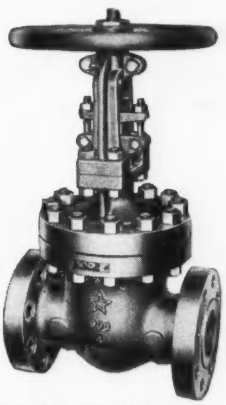


Fig. 9003—Class 900-pound Cast Steel O.S. & Y. Gate Valve.

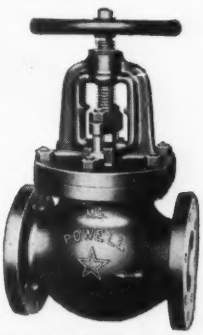


Fig. 241—Large 125-pound Iron Body Bronze Mounted O.S. & Y. Globe Valve.

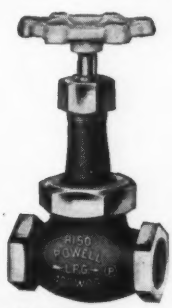


Fig. 8150—Bronze L.P.G. Globe Valve with special composition disc. Write for descriptive circular 8-48B.

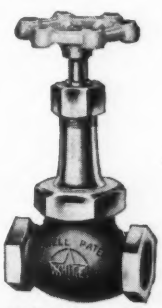


Fig. 1708—200-pound Bronze Globe Valve with renewable stainless steel seat and regrindable, renewable "Powellium" nickel-bronze disc.

POWELL VALVES

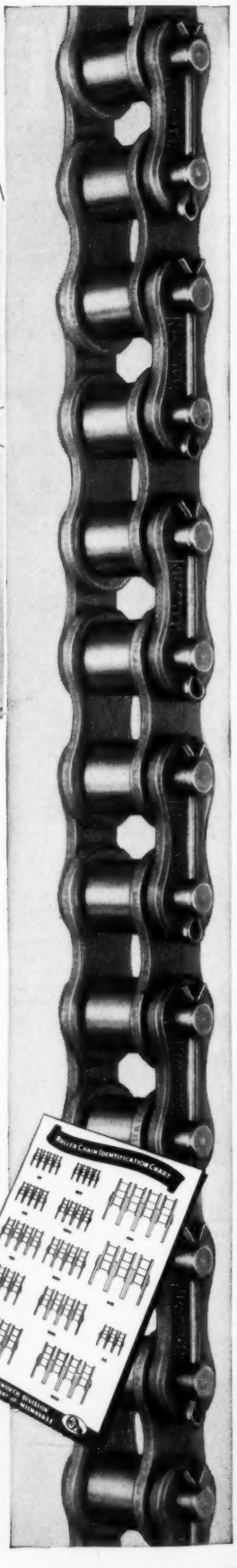
Sure, they look alike ...but

. . . take a closer look. Under a magnifying glass you'll see important differences . . . differences that make it easy to tell two fingerprints apart.

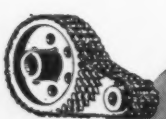
Similarly, with roller chains there are important differences that would show up under the microscope—differences that make it easy to recognize the superiority of Baldwin-Rex Roller Chains.

For instance, Baldwin-Rex Multiple Width Roller Chains have a press fit of the inner side plates on the pins. This eliminates the motion between pin and side plates . . . stops those early pin failures. And all parts—pins, bushings, rollers, and side bars—are constructed of highest quality metals, then are accurately heat treated to give them the utmost strength and resistance to wear.

The next time, don't ask for just roller chain . . . *ask for Baldwin-Rex.* It is interchangeable with any corresponding size roller chain.



Send for your FREE copy of this time-saving wall chart of Oil Field Roller Chains. All you have to do is compare your worn roller chain with the corresponding drawing on the chart and order the new Baldwin-Rex Chain by number from your local supply store. BALDWIN-DUCKWORTH DIVISION OF CHAIN BELT COMPANY, 357 PLAINFIELD STREET, SPRINGFIELD 2, MASS.



BALDWIN·REX

ROLLER CHAINS

Why Chemico-built Plants are Profitable

Improved Processes

A chemical plant is only as good as the process it uses. Chemico originates, controls, and provides many of the most advanced processes and equipment . . . develops entirely new processes where necessary.

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Chemico-built plants are designed to meet each client's requirements. Capacity, type of raw material, available utilities, location, space limitations . . . all are considered.

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Automatic operation, centralized control, efficient plant layout . . . reduce manpower requirements and make more productive use of every man-hour.

Minimum Maintenance

Maintenance problems are simplified through the use of carefully selected equipment and improved processes, and careful layout of the plant. Repairs are never "hard to get at."

Experience

Chemico designs and builds many kinds of heavy-chemical plants . . . has been doing this for 34 years. Over 600 installations the world over are evidence of Chemico's successful experience.

Chemico furnishes these plants under one contract—one responsibility—with an iron-clad performance guarantee . . . is prepared to undertake other similar projects on the same basis.

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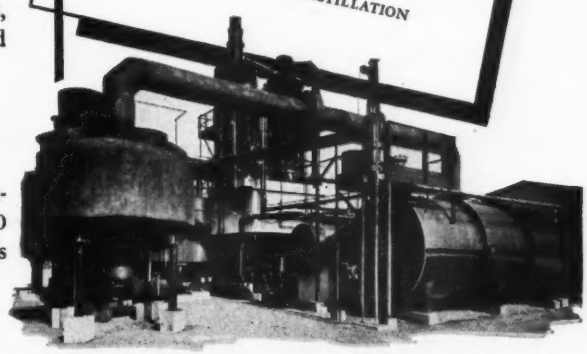
PETROLEUM SLUDGE CONVERSION
FORMALIN
WILTON PROCESS TAR DISTILLATION



CHEMICAL CONSTRUCTION CORPORATION

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EUROPEAN TECHNICAL REPRESENTATIVE
CYANAMID PRODUCTS, LTD., BRETTENHAM HOUSE, LANCASTER PLACE, LONDON W. C. 2, ENGLAND
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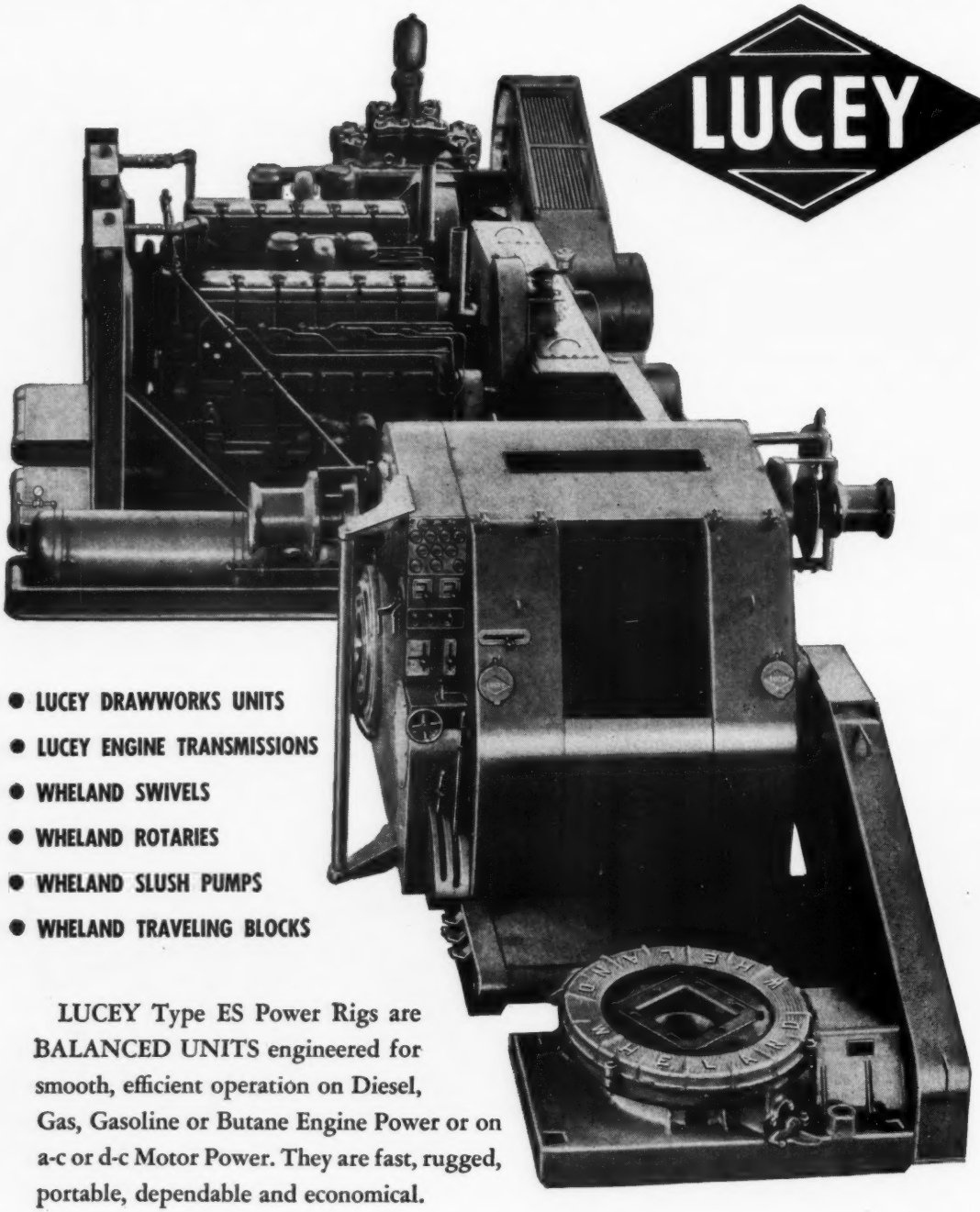
"Chemico plants are profitable investments"

CC 165

LUCEY TYPE ES DRILLING RIGS

LUCEY



- LUCEY DRAWWORKS UNITS
- LUCEY ENGINE TRANSMISSIONS
- WHELAND SWIVELS
- WHELAND ROTARIES
- WHELAND SLUSH PUMPS
- WHELAND TRAVELING BLOCKS

LUCEY Type ES Power Rigs are BALANCED UNITS engineered for smooth, efficient operation on Diesel, Gas, Gasoline or Butane Engine Power or on a-c or d-c Motor Power. They are fast, rugged, portable, dependable and economical.

Write for further information.

LUCEY EXPORT CORPORATION

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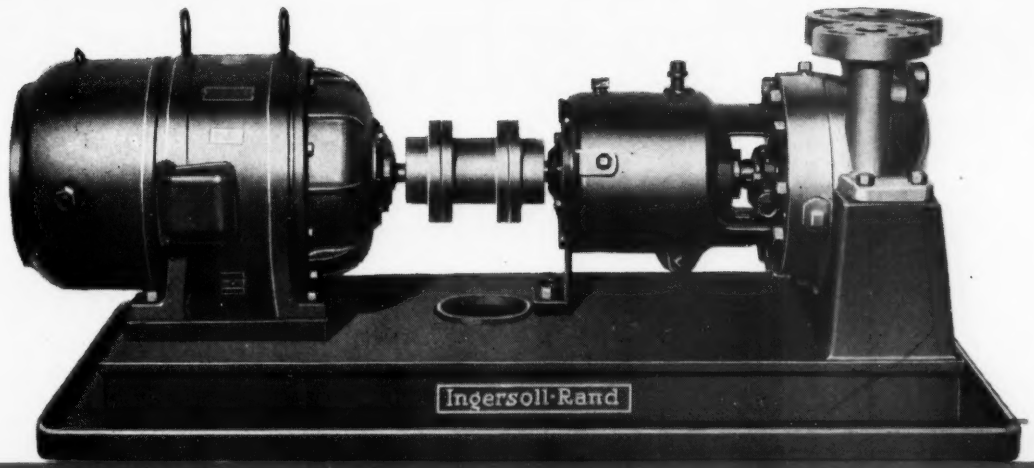
San Fernando, Trinidad, B. W. I ● 615 8th Avenue West, Calgary, Canada



LIQUID-MOVER FOR REFINERIES

Deep stuffing box—may be packed to suit any liquid . . . solid . . . liquid seal . . . grease seal . . . or may be equipped with the Cameron Shaft-Seal.

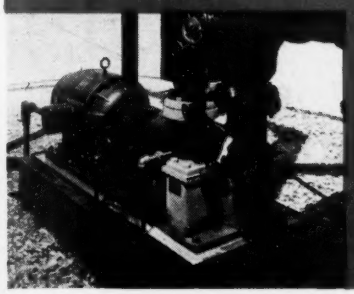
Easy to dismantle—cradle and entire rotor can be removed without disturbing the suction or discharge piping.

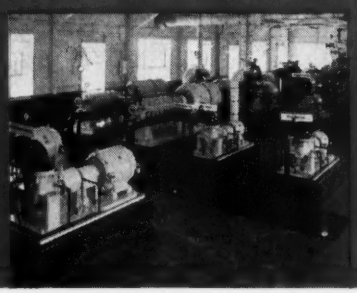
Top suction and discharge—simplifies piping and makes unit self-venting. (A similar line of pumps is available with end suction and top discharge.)

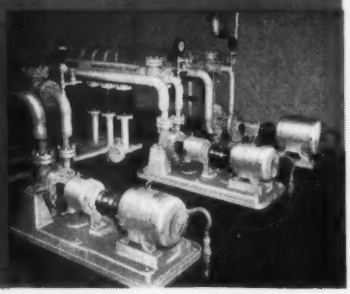
Precision workmanship and inspection assure easy replacement of parts and low maintenance.

Centerline support and expansion compensating features keep unit tight even when handling liquids up to 800 F.

Correct materials selected by I-R metallurgical department to assure long life.







Liquids by the millions of barrels must be moved in a refinery. Centrifugal pumps do the major part of this tremendous job . . . and the Cameron Division of Ingersoll-Rand builds a complete line of centrifugal and mixed-flow pumps for all phases of refinery service.

One of the important types is the single-stage process pump shown above. Built into it are features which assure the reliability and efficiency required for continuous operation under severe conditions.

That's why so many hundreds of these pumps are helping produce aviation gasoline, toluene, butadiene and other petroleum products. Let our engineers tell you more about them . . . and the other pumps in the I-R refinery line.

COMPRESSORS • AIR TOOLS
ROCK DRILLS • TURBO BLOWERS
CONDENSERS • CENTRIFUGAL PUMPS
OIL AND GAS ENGINES

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, NEW YORK

Cameron Pump Division

75-10

HOW TO REDUCE CAPITAL INVESTMENT in modern oil fields

...and cut production costs!

Eliminate gage tanks and minimize piping by discharging oil and gas directly into production lines.

Prevent crude spill-over into gas lines.

Conserve crude by avoiding dissipation of well pressure.

Stop evaporation losses due to weathering.

Quickly detect sleepers or wet wells.

Minimize fire hazards.

WITH

BOWSER ESTABLISHED 1885

AUTOMATIC WELL-CHECK SYSTEMS

This equipment combines meter, separator, sampler and strainer in one unit . . . provides an indisputable basis for royalty and tax payments . . . reduces labor and transportation costs . . . puts each well on its own merits.

Dependable operation is assured on flowing wells, pump pressure or vacuum. Available also as a portable unit.

Write for complete information to Bowser, Inc., 1328 Creighton Avenue, Fort Wayne 2, Indiana, or to the nearest district office.

LIQUID CONTROL SPECIALISTS SINCE 1885

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468 9th St., San Francisco 3, Calif.
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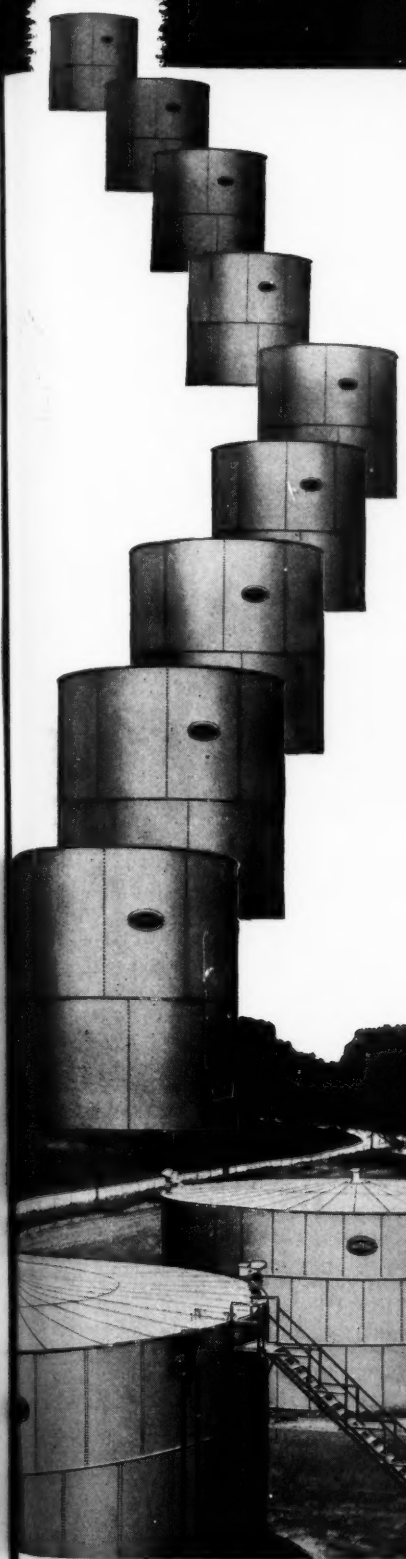
n Line Production
Line With Demand

BUTLER BOLTED TANKS QUICKLY AVAILABLE



Now! Prompt delivery—for a quick solution to your oilfield storage problems. Butler Bolted Tanks are available now, ready to bring you lifetime economy for the storage and handling of crude or finished petroleum products.

Without delay, you can profit by the precision fabrication, ease of erection, oiltight protection which these time-proved storage tanks give you.

As long as steel is available, you will be able to get prompt delivery on Butler Bolted Tanks. Butler's efficient line production methods assure you of that!

Call your nearest Butler distributor now—while tanks are in good supply.

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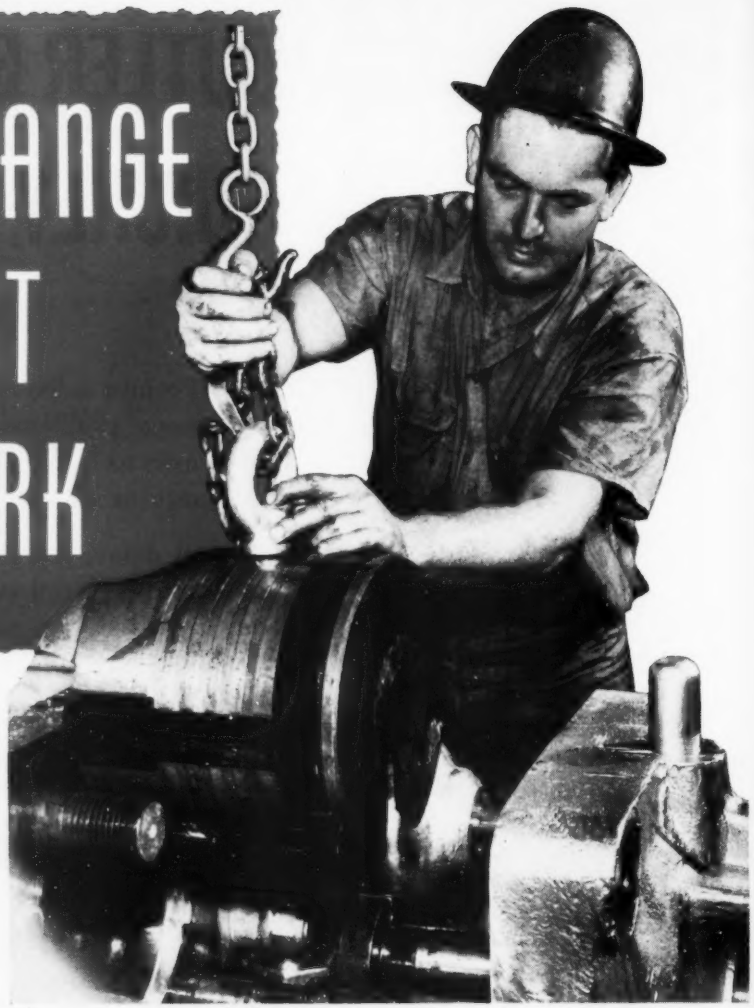
QUICK-CHANGE ARTIST AT WORK



CHANGING RAMS IN CAMERON TYPE "QRC" BLOWOUT PREVENTERS REQUIRES ONLY A FEW MINUTES... SAVES COSTLY RIG TIME

Any "oil field hand" who has ever changed a set of blowout preventer rams will find it hard to believe that the largest size rams in Cameron "QRC" Blowout Preventers can be changed in a few minutes time. Actually, the change requires only (1) the loosening of four hammer lug nuts on each bonnet, (2) turning a pressure control valve to "open" position, thus withdrawing the rams from the preventer body, and (3) lifting straight up on the rams with the catline. These simple operations in reverse order complete the ram change.

Of equal importance is the fact that "QRC" models provide an eight-to-one ratio of closing pressure to well pressure, that is, 1000 lbs. closing pressure will close the rams against approximately 8000 lbs. well pressure. This more favorable ratio is made possible by a unique by-pass on the lower side of the rams which diverts well pressure to the rear of the rams as an aid in closing.

Complete details will be gladly sent to interested operators on request.

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Export: 74 Trinity Place, New York, N. Y. Oklahoma: 310 Thompson Bldg., Tulsa (Telephone 28970). California: Long Beach (P. O. Box 267). Wyoming: 356 N. Wolcott St., Casper. North Louisiana: Bossier City (P. O. Box 425). Texas: Midland (Telephone 1982), Corpus Christi (Telephone 28783), Ft. Worth (Telephone 46522).

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Yesterday's low price—today's high value.

GEARED TO THE TEMPO OF EACH NEW DAY

Utility ELECTRIC POWER

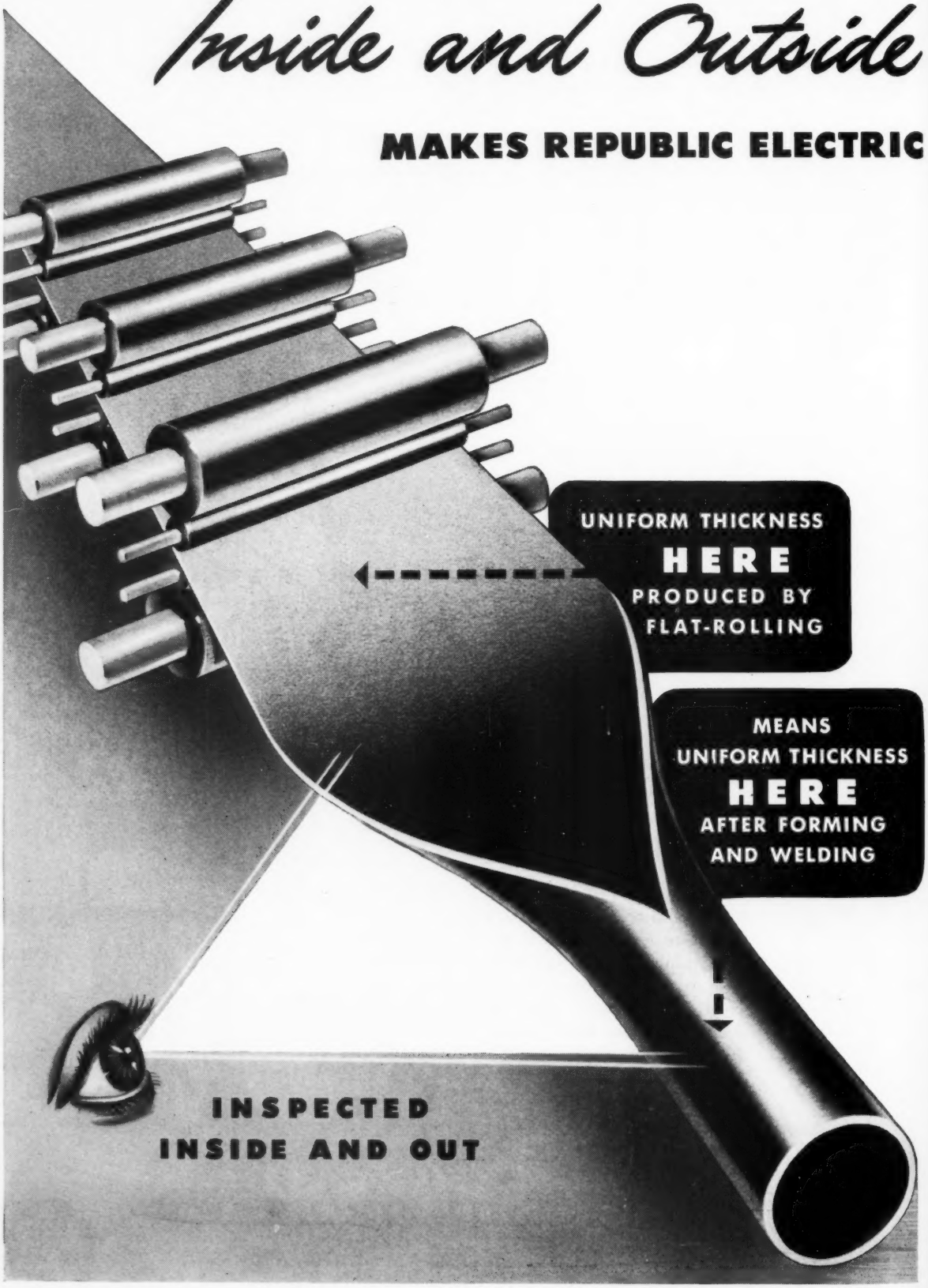
Use Utility Electric Power!

PETROLEUM ELECTRIC POWER ASSOCIATION

Box 1498, Oklahoma City, Oklahoma

Inside and Outside

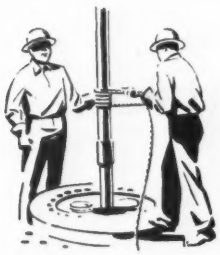
MAKES REPUBLIC ELECTRIC

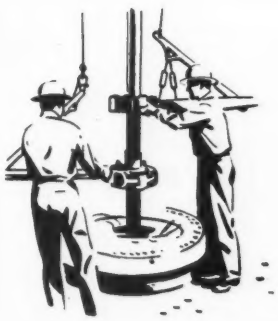


Inspection

WELD CASING AND TUBING

The Best Your Money Can Buy!





● Unlike tubular products manufactured by other processes, Republic Casing and Tubing are made from *flat-rolled steel*, cold formed and electric resistance welded. This advanced method brings you finished products with two exclusive advantages:

FIRST—every square inch of *both* surfaces is open to complete visual examination. Thus, the inside wall surface is just as free from hidden defects as the outside.

SECOND—walls are uniformly thick and strong throughout the entire length . . . with the weld proved 100% as strong as the wall. Full-formed threads are anchored solidly in sound steel, with *a uniform thickness of tough metal under their roots to protect against pull-outs.*

In addition, these improved oil country products bring you high ductility steel, fully normalized for uniform structure, cold sized for high yield strength—qualities which combine with uniform roundness and wall thickness to provide high collapse resistance.

Add the fact that Republic Casing and Tubing stab, spin-in and tong-up fast—that their straight lengths handle easily, help maintain stabbing speed—and you have more reasons why they're the best your money can buy.

Millions of feet placed in service in all fields, under all operating conditions, have proved that Republic Electric Weld Casing and Tubing are safe, sound and economical. Specify them with complete confidence.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

REPUBLIC *Electric Weld*
NORMALIZED CASING AND TUBING

REPUBLIC STEEL
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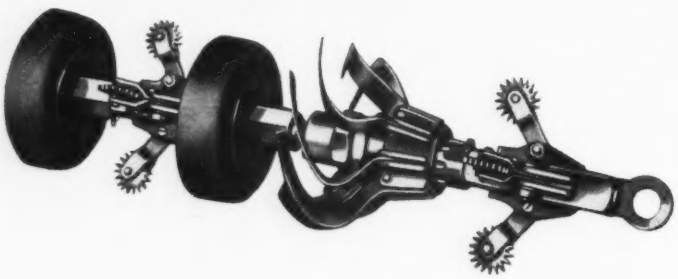
Other Republic Products include Line Pipe—Carbon, Alloy and Stainless Steels—Upson Studs, Bolts and Nuts—Electrunite Heat Exchanger Tubes

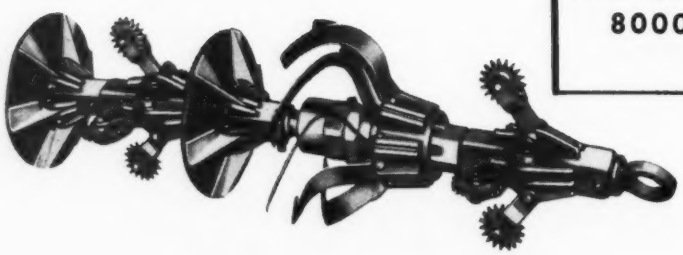
Since TRANSIT introduced the Line Scraper, over 50 years ago, there has been continual improvement in this invaluable pipeline tool. Efficient performance is taken for granted in TRANSIT Scrapers - as is ***uniform ruggedness of construction,*** giving assurance that the scraper will not fail or fall apart in service.



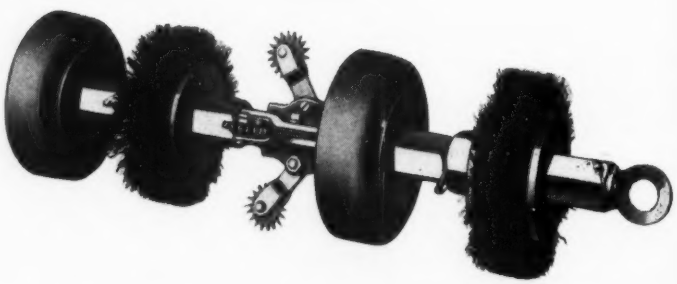
Ask for Bulletin 8000 and 8051

3031—Scrapers with Neoprene Caps.

3032—with leather discs



3033—with wire brushes is commonly used for gasoline lines.



Are your Transit Scrapers in shape for seasonal line cleaning? A generous stock of parts is on hand at our Works and Tulsa Warehouse.

NATIONAL TRANSIT PUMP AND MACHINE CO.

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The Lang Company, 267 West First South St., Salt Lake City, Utah

Eugene V. Winter Co., 15 Drumm Street, San Francisco, California

Standard Supply and Hardware Company, 822-838 Tchoupitoulas St., New Orleans, Louisiana

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Here's the Combination

SHOOT-N-TEST

Trademark

JOHNSTON FORMATION AND CASING TESTING

that enables you to PERFORATE and TEST IN A SINGLE RUN

The Johnston "SHOOT-N-TEST" Gun Perforator connected to a regular JOHNSTON PRESSURE RECORDER and FORMATION TESTER permits both casing perforating and formation test in a single trip of tubing or drill string.

The JOHNSTON *FORMATION TESTER*

The JOHNSTON FORMATION TESTER is relied upon by operators throughout the world for determining the productivity possibilities of sands encountered in drilling wells as they are penetrated without the expense of setting casing. Its wide range of applications makes it adaptable to every formation testing job on the lease.

The "SHOOT-N-TEST" *GUN PERFORATOR*

The JOHNSTON "SHOOT-N-TEST" GUN PERFORATOR has the versatility to be used solely as a casing perforator or as the perforating unit in combined perforation and test operations. Its design embodies many advanced features to make it the ideal choice for operators desiring utmost safety and efficiency in perforation equipment.

● By unitizing a Johnston "SHOOT-N-TEST" Gun Perforator with a regular Johnston Formation Tester Assembly, any designated formation can be both perforated and tested in one round trip of tubing or drill pipe. The "SHOOT-N-TEST" Gun Perforator is easily connected to Johnston test equipment for combined Perforation and Test operations. Simple top-hole manipulation of the string by the driller readies the Gun Perforator for firing—existing hydrostatic pressure in well trips the firing mechanism.

M. O. JOHNSTON OIL FIELD SERVICE CORP.

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"Servicing California-Permian Basin-Rocky Mountain Areas"

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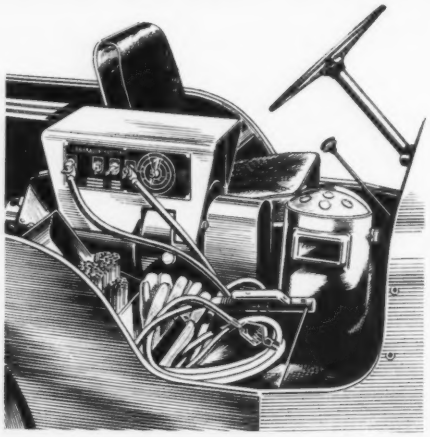
NEW WORK TEAM—'JEEP' AND 'GE' WELDER



GENERAL ELECTRIC ARC WELDERS for the Universal 'Jeep' and 'Jeep' Truck are made in two capacities:

200 amperes DC; electrode sizes 1/16" to 3/16" (1/4" for occasional jobs); current range minutely adjustable from 30 to 250 amps. DC.

300 amperes DC; electrode sizes 1/16" to 1/4" (5/16" for occasional jobs); current range minutely adjustable from 45 to 440 amps. DC.

Both are precision-built units for high-quality, fast-welding performance.

A mobile welding unit that gets to jobs *anywhere,* that powers itself and delivers "shop quality" in the field—that's the Universal 'Jeep' with a General Electric Arc Welder.

With 4-wheel-drive traction and high maneuverability, the 'Jeep' reaches locations too tough for ordinary vehicles, taking mud, sand, snow and steep grades in its stride.

The generator is powered by V-belt drive from the 'Jeep' Engine, assuring steady, efficient operation and a saving on initial and maintenance costs.

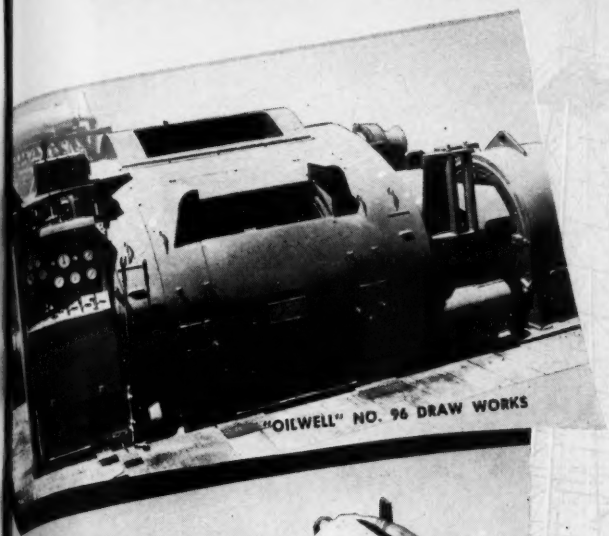
If you need larger load space, the General Electric Arc Welder can also be installed in and powered by the 'Jeep' 4-wheel-drive Truck.

Get the full story of this self-propelled, self-powered welder from any Willys-Overland dealer.

4-WHEEL-DRIVE UNIVERSAL Jeep'

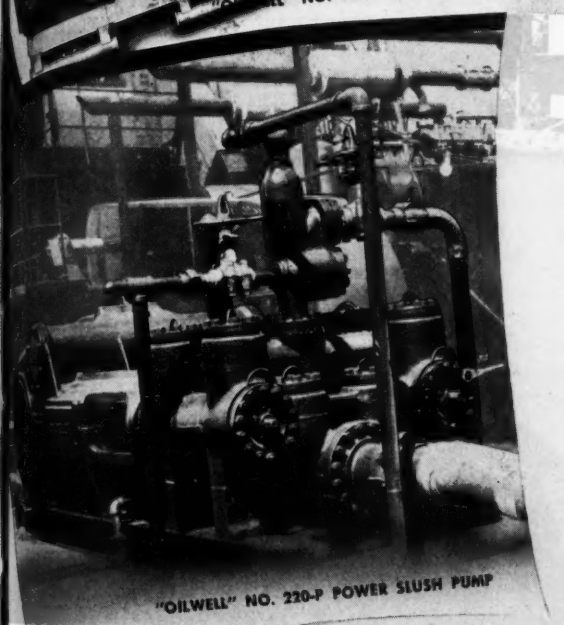
WILLYS-OVERLAND MOTORS • TOLEDO • MAKERS OF AMERICA'S MOST USEFUL VEHICLES

Maximum Performance with a Balanced *Rig* the "Oilwell" No. 96



"OILWELL" NO. 96 DRAW WORKS

"OILWELL" NO. 1000 TRIPLE ENGINE DRIVE



"OILWELL" NO. 220-P POWER SLUSH PUMP

HERE is a complete mechanical rig designed for fast, economical, deep-hole operations. All major equipment is ENGINEERED TO WORK TOGETHER. Each unit is a dependable performer in itself. Together they make up an outstanding smooth-running combination that operates efficiently at low overall cost.

Users throughout the world recommend the "Oilwell" No. 96 Mechanical Rig because—

1. It is easy to move, quick to rig up and keeps running with a minimum of down time.
2. It has a compact control panel with a bank of easy-to-read dials which show oil and air pressures, engine speeds and power loads, and which provides the driller with fingertip selection of all clutch, braking and cathead operations.
3. It is designed so that all parts are protected, yet are readily accessible for servicing and maintenance. Unitized major assemblies remain permanently in alignment at all times.

Ask your "Oilwell" representative —for complete information on the "Oilwell" No. 96 Draw Works illustrated with "Oilwell's" No. 1000 Triple Engine Drive; as well as on the following companion equipment engineered for corresponding drilling depths:

"Oilwell" No. 220-P Power Slush Pump (Illustrated).
"Oilwell" No. 580 Crown Block.
"Oilwell" No. 480 Streamline Traveling Block.
"Oilwell" 400-Ton Swivel (No. 300-D)
"Oilwell" 21-A Super-speed or 27½-B Rotaries.
"Oilwell" Brantly Rotary Feed Control.

By buying your equipment from "Oilwell" you profit by "Oilwell's" design engineering experience, as well as "Oilwell's" continuous field assistance.

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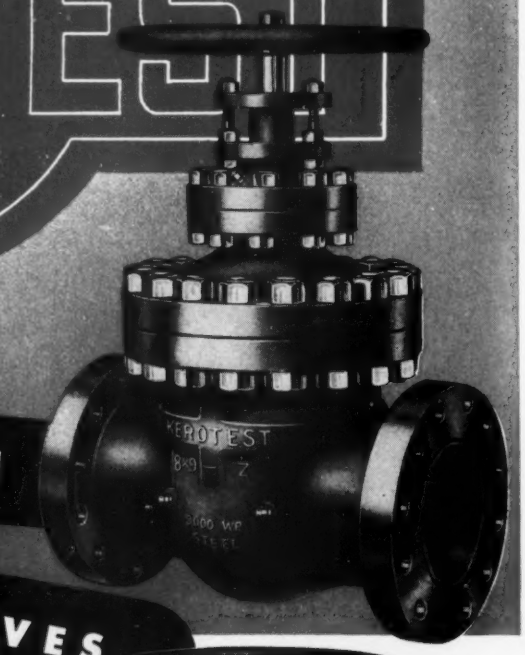
USS "OILWELL"
UNITED STATES STEEL

KEROTEST

PRECISION ENGINEERED
Cast Steel

FLOW LINE and
DRILLING VALVES



KEROTEST developed the *first* cast steel gate valve adopted by the oil industry and today, more than ever, offers you the latest developments in precision-engineered cast steel valves for every oil field need. KEROTEST Valves meet every requirement from the day you spud-in . . . to production . . . to distribution manifold . . . pipe line . . . and refinery. Call in your local Kerotest engineer on your *next* operation.

KEROTEST MANUFACTURING CO.
PITTSBURGH 22, PA.

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KEROTEST

America's First Name in Quality Valves . . . .

Rugged Durability

OLSON DRILLING COMPANY
PETROLEUM BUILDING
TULSA, OKLAHOMA

June 22, 1948

Mr. Arch F. Campbell, Manager
Petroleum Industry Sales
Detroit Diesel Engine Division
General Motors Corporation
1504 Philtower Building
Tulsa 3, Oklahoma

Dear Mr. Campbell:

In July, 1945 we put two of your General Motors Quads in service on a National #100 rig, giving us a total of 1200 HP.

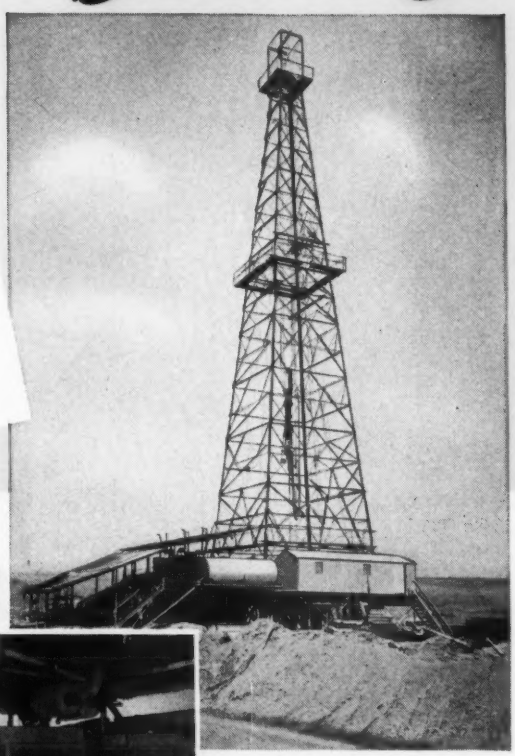
Since that time these engines have drilled 38,378' of "Deep" hole, without major repairs - during 723 days of actual operation.

In our opinion, these engines have the rugged durability required for successful operation in the oil fields.

Yours very truly

Vice-President

MSD :W



for Deep-Hole Drilling

Olson Drilling Company's National "100" rig, powered with two GM Series 71 "Quad 6" engines, drilling on Carter Oil Co. Smith-Lee No. 1 well, near Lindsay, Okla. Besides the drawworks, the "Quads" operate two Clark Triplex pumps.

TAKE the word of men who use them — these General Motors Series 71 Diesel engines deliver the rugged, flexible power that's needed for successful deep-hole drilling. Their 2-cycle operation (power at every downstroke) makes them unusually powerful for their modest size and weight. They snap into action and pick up their loads fast—saving valuable time getting a string in or out of a hole.

Above all, these sturdy GM Diesels can be depended upon to do their jobs smoothly and efficiently day after day, month in, month out, with a minimum of attention. And when it comes time to move on, their compactness means easier setups and lower moving costs.

Whether you are buying new equipment, or repowering old units, it will pay you to investigate GM Diesel power. Choose from "Singles," "Twins" or "Quads" in a wide range of power. See your GM Diesel distributor listed below or write direct to us.

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES.. Up to 200 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS.. Up to 800 H.P.

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DIESEL BRAWN WITHOUT THE BULK

GENERAL MOTORS CORP., DIESEL ENGINE SALES, PETROLEUM INDUSTRY, 1504 Philtower Bldg., TULSA 3, OKLAHOMA

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Power Equipment Inc. WICHITA, KANSAS
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THE price paid for Attapulgus and Porocel adsorbents is around *one cent* per pound—a fact which, we will agree, makes pretty dull reading. But for refiners using our materials, this modest investment pyramids to phenomenal returns. To be specific, each pound properly applied to petroleum stocks increases their value by at least *one dollar*—a return of 100 to 1.

Some three and one-half billion pounds of fullers earth and bauxite have been shipped to refineries by Attapulgus and Porocel—a noteworthy record of service to the industry. But what is even *more* noteworthy is the fact these materials have put three and one-half billion dollars in refinery tills.

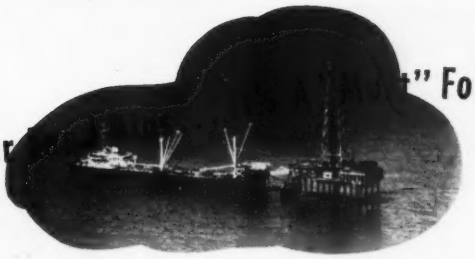
That's the record to date. It was accomplished by adsorbent-treating a wide variety of hydrocarbons to effect reduction or removal of colors, odors, tastes, moisture, sulfur, acids, fluorides and unsaturates, and for catalytic purposes. It's a record for *you* to tie to when considering plans to improve quality, expand output, or both.

Consult with us freely. Our broad knowledge of the behavior of our products under many sets of conditions should go far in helping *you* get 100 for 1.

ATTAPULGUS CLAY COMPANY *Fullers Earth* • **POROCEL CORPORATION** *Activated Bauxites*

Dept. V, 210 West Washington Square, Philadelphia 5, Pa.

You'll Want It For [illegible]" For Off-shore Work



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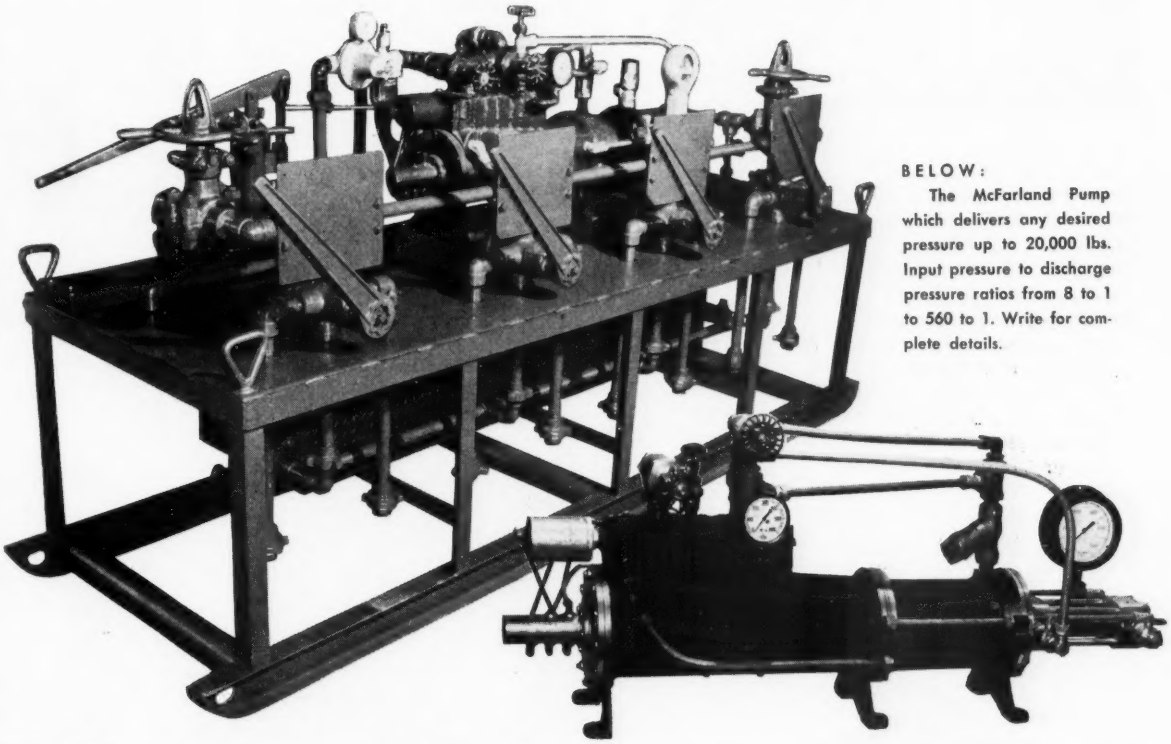
PORTABLE UNITIZED PRESSURE-OPERATED BLOWOUT PREVENTER MANIFOLD WITH McFARLAND HIGH-DISCHARGE PUMP



BELOW:
The McFarland Pump which delivers any desired pressure up to 20,000 lbs. Input pressure to discharge pressure ratios from 8 to 1 to 560 to 1. Write for complete details.

Everything You Need In One Sturdy, Compact Unit To Make Pressure-Operated Preventers *Prevent!*

- Custom built to accommodate any number of control units. Ready to operate . . . only requires connection to air supply line and preventers.
- Self-contained fluid reservoir of sufficient capacity to operate any desired number of preventers and valves. Completely enclosed fluid system prevents any foreign matter from entering rams.
- Auxiliary hydraulic hand pump mounted on unit for extra safeguard.
- Skid-mounted and provided with lifting eyes to facilitate handling and transporting.

PLEASE WRITE FOR COMPLETE INFORMATION

LINK-BELT PRODUCTS *Geared to* OIL INDUSTRY NEEDS

● Link-Belt oil industry products are backed by the vast resources that come from over 70 years of industrial progress. Unfailing performance proves this wherever men drill for and produce oil. Whether in use in original equipment manufacture or as replacement parts in field service, products that bear the Link-Belt trademark have earned and won the acceptance of operators since the oil industry's pioneer days. Examples of Link-Belt's oil industry line are shown here. The complete line is shown and described in your Composite Catalog.

LINK-BELT COMPANY

Engineers - Manufacturers - Exporters - Established 1875
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EXPORT DIVISION:
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Offices, Factory Branch Stores, and Distributors in Principal Cities and Representatives throughout the World.
Cable and Radio Address: LINKBELT—NEW YORK.

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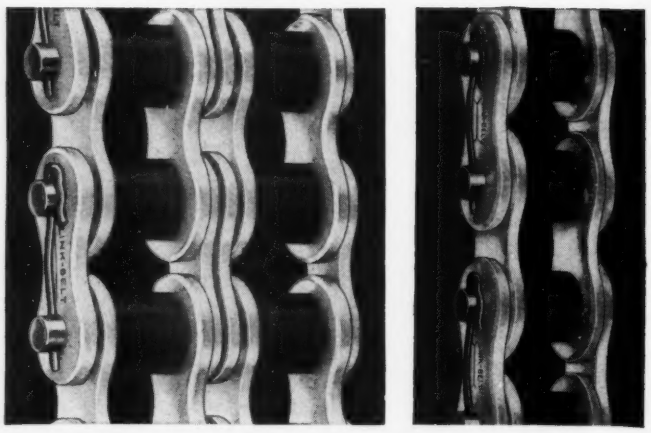
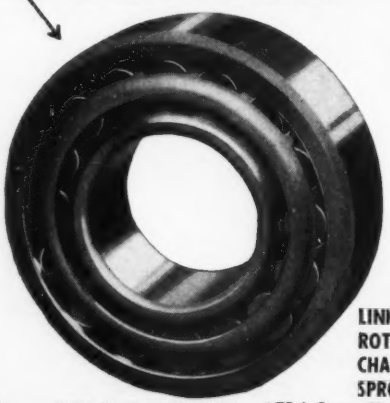
LINK-BELT ENCLOSED GEAR DRIVES

L-B enclosed Herringbone Gear speed reducing and increasing drives are made in single, double and triple reductions. Also furnished in Worm Gear, and Gearmotor types, including P.I.V. Gear Variable Speed Changers, in various reductions, ratios and horsepowers.



LINK-BELT SILVERLINK OIL FIELD ROLLER CHAINS AND SPROCKETS

Made in all required sizes and widths, including sprockets. Alloy steel construction, great strength, light weight and ability to withstand shock has made it the top chain choice of operators and manufacturers alike.



LINK-BELT BEARINGS

Available in a wide range of sizes, ball and roller types, unmounted or mounted as pillow blocks, cartridge and flange units or other mountings.

LINK-BELT ROTARY CHAINS & SPROCKETS

API-4 Super Hyper Precision rotary chain, an exclusive Link-Belt design, is one of several L-B types of heavy duty (SS) rotary chains and sprockets. It's stronger, longer lasting.

LINK-BELT SHALE SHAKER MUD SCREENS

Available in single or dual sizes . . . made in three unitized sizes, including intake boxes: NRM-124—24"x48", NRM-145—48"x60" and NRM-134—36"x48". Specify dependable L-B Shale Shakers. They'll keep you out of mud trouble.

LINK-BELT

POWER TRANSMISSION MACHINERY
ROTARY MUD SCREENS

. . . because it conditions mud in a hurry

MAGCOGEL makes for faster, safer more economical drilling

Since MAGCOGEL . . . a concentrated colloidal material for drilling mud . . . is especially processed and ground uniformly finer than other bentonites, it is completely dispersed and quickly hydrated so that its effect on wall building and gel properties is present as soon as the mud enters the hole.

Mixed with water alone, it makes a low-per-barrel-cost mud having all of the desirable properties required of a good drilling fluid except weight.

MAGCOGEL is made from the finest, carefully selected Wyoming Bentonite. It's stocked by more than 200 MAGCOBAR dealers from the Rockies to Florida.

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DRILLING MUD SERVICE
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Ensign "Kgl" Gas Carburetor and Model "B" Fuel Regulator

DEPENDABILITY ASSURED

This popular AJAX model CMB two cycle gas engine produced by AJAX Iron Works illustrates excellent practice in adaptation of downdraft gas carburetion.

Easy to start and easy to adjust ENSIGN offers the trade a proven unit, the best in carburetor performance and economy that years of experience and technical skill can produce.

It matters little the type of engine: Slow speed single cylinder two or four cycle or the high speed multi-cylinder type, ENSIGN is PROVED and ACCEPTED the world over with DEPENDABILITY ASSURED.

**Over 92 percent of all carburetted gas engines use ENSIGN*

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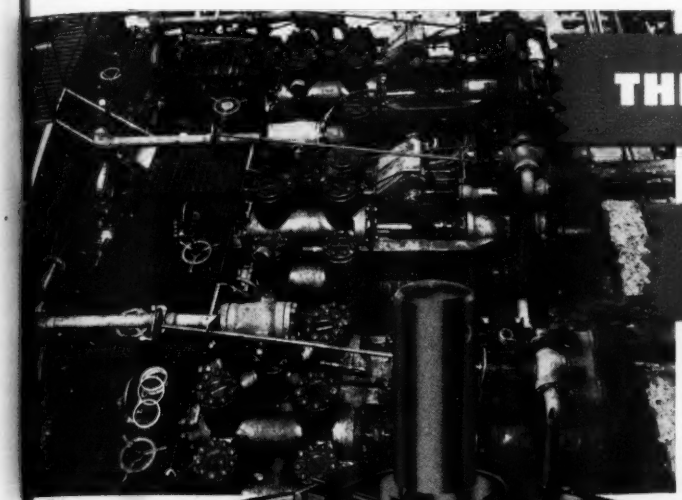
Dealers and Distributors in All Principal Oil Fields

Murray molds



THE LATEST DEVELOPMENT

IN AMERICAN IRON & MACHINE WORKS CO. SLUSH PUMP

VALVE INSERTS

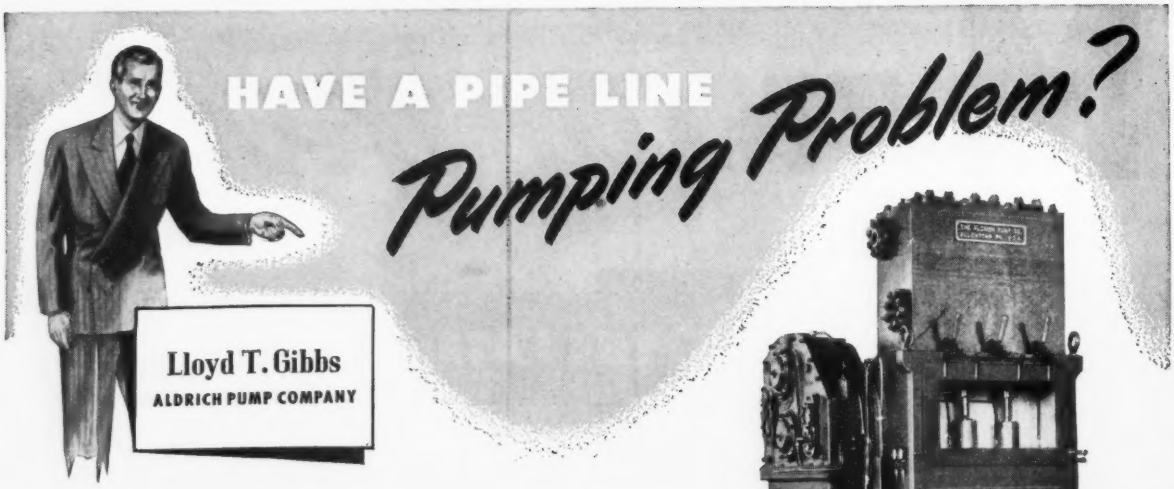
THE NEW 9C and 11C INSERTS which Murray molds for American Iron and Machine Works have established a remarkable record of performance and long life under the terrific pounding of modern high pressure pumps.

Multi-cavity molds for these oil-heat-and-acid resistant inserts were produced in the Murray Tool and Mold Division. Murray maintains this machine shop for the express purpose of relieving customers of the engineering and manufacturing details incidental to the production of molds, metal inserts, dies and other precision machine work.

When you have a rubber molding problem, bring it to Murray where the facilities of the largest, most modern and complete rubber manufacturing plant in the South assures a prompt and economical solution.

MURRAY RUBBER CO.
HOUSTON, TEXAS

Murray Rubber



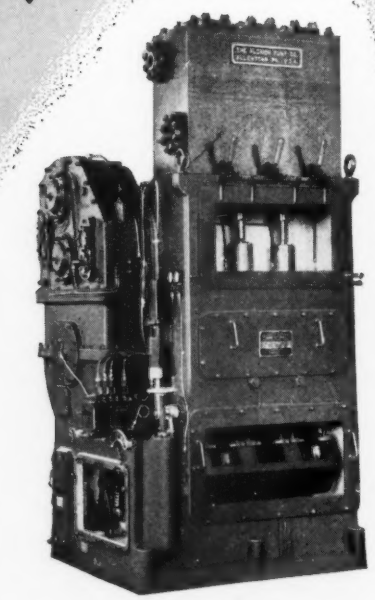
"Take it from me," says Lloyd T. Gibbs, pumping expert in the Mid-Continent Area, "Aldrich has the answer. Here are three Aldrich Pumps that were designed and built for pipe line, oil field and refinery service. One of them—or one of the new larger pumps—should meet your individual requirements, regardless of pumping problems, pressures or capacities. And, in every case, maintenance costs are rock bottom!"

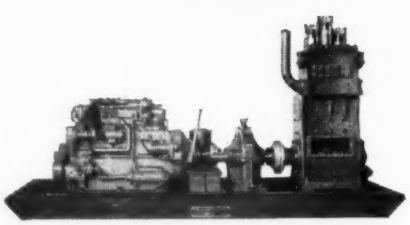
Your answer may be the Aldrich Groff "POWR-SAVR"—a constant speed, variable stroke, variable capacity pump. It will handle any free flowing liquid and can be automatically controlled to provide stepless, straight-line variation from zero to rated maximum output. Adjustable pressures up to 15,000 psi can be maintained—variance will not exceed 2% to 5% of that desired. Maintenance costs are low, and power consumed is practically proportional to delivery.

Or, perhaps the Aldrich Inverted Vertical Quintuplex Pump will meet your requirements. It can be equipped with built-in gearing (except in higher HP ratings) or with direct coupling to prime mover. You'll find it highly applicable where large volumes of fluid must be moved against medium or high pressures.

Possibly, the Aldrich Inverted Vertical Triplex Pump —a high pressure, constant stroke, constant speed pump—is your solution. Drive arrangements can be made through gear-head motor, built-in pump gearing from extended pinion shaft or chain, flat or V-belt from extended crankshaft. Pressures up to 8350 psi are maintained.

Lastly, maybe the really BIG Aldrich Inverted Septuplex and Nonuplex Pumps will suit. These pumps are constructed along the same lines as the Quintuplex but with more pump cylinders. Available in pump sizes up to 2400 HP, they are ideal where large volumes of liquid must be moved against medium or high pressure.



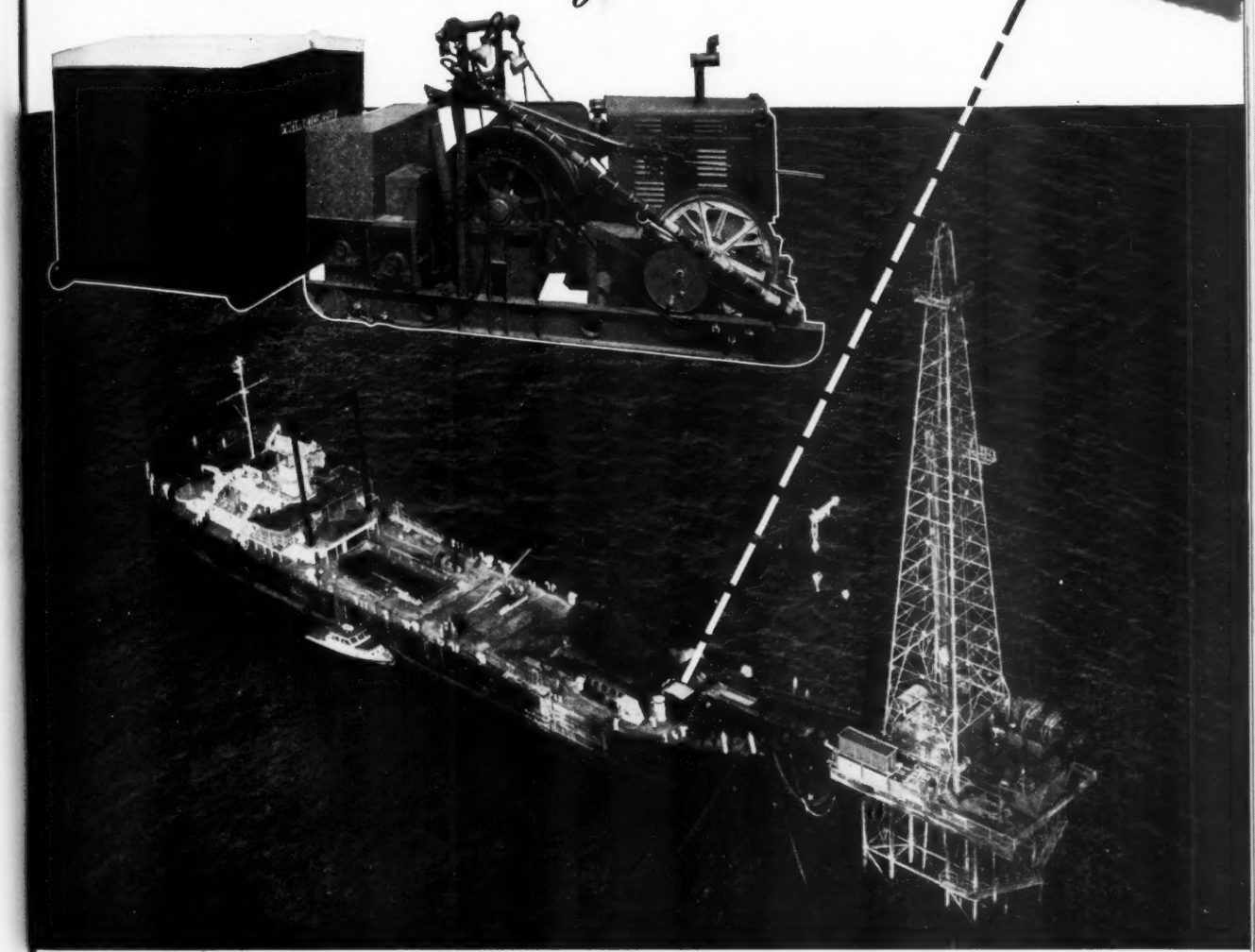


THE ALDRICH PUMP CO., 9 GORDON STREET, ALLENTOWN, PA.

ALDRICH THE *First* NAME IN OIL FIELD PUMPS

Representatives: Birmingham • Bolivar, N. Y. • Boston • Chicago • Cincinnati • Cleveland • Denver • Detroit Duluth • Houston • Jacksonville • Los Angeles • New York • Omaha • Philadelphia • Pittsburgh • Portland, Ore. • Richmond, Va. • St. Louis • San Francisco • Seattle • Spokane, Wash. • Syracuse • Tulsa

The Schlumberger OFFSHORE UNIT



PUTS ALL SCHLUMBERGER SERVICES RIGHT ON DECK FOR MARINE OPERATIONS

Wherever drilling has moved offshore, there you will find a complete, modern Schlumberger unit capable of providing all the sixteen Schlumberger services. This permanent fixture in modern offshore drilling practice is the result of research and engineering designed to keep up with the drilling industry under any and all conditions.

SCHLUMBERGER
WELL SURVEYING CORP.
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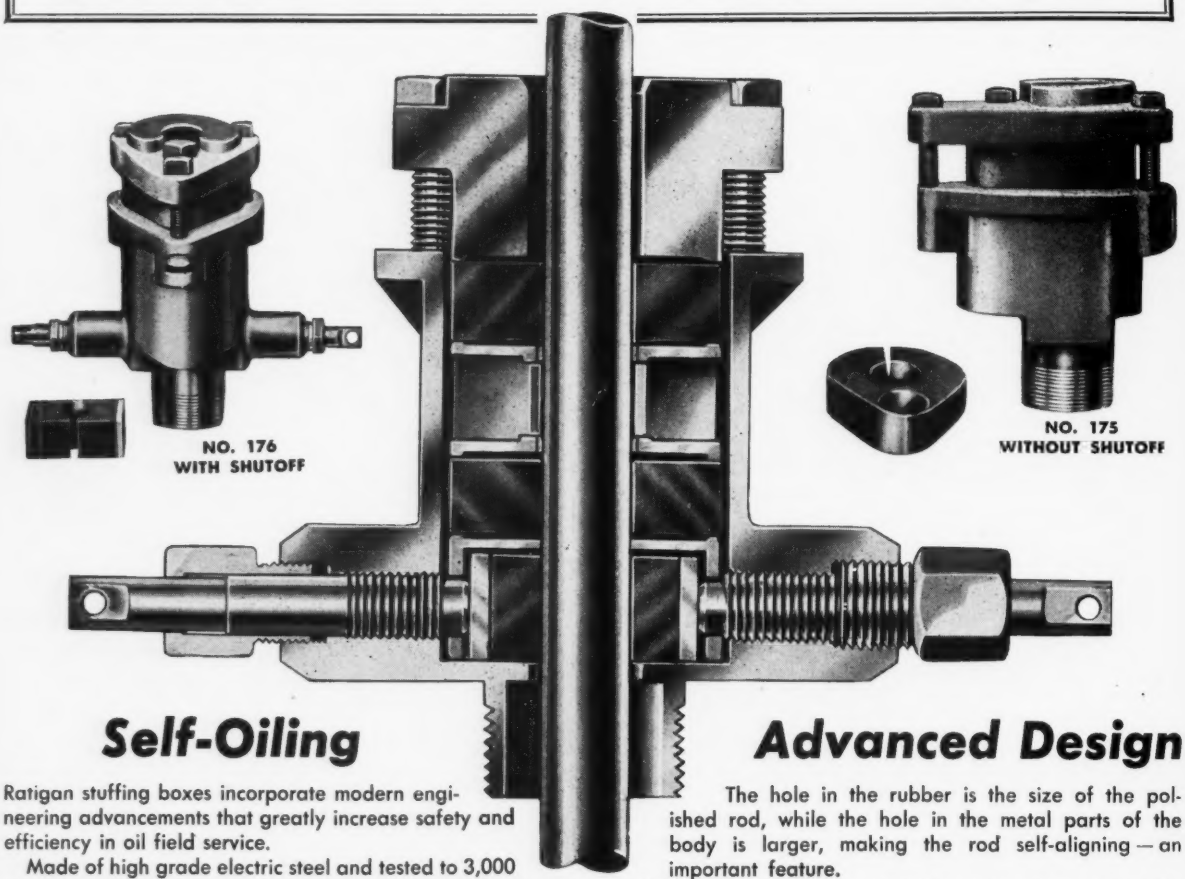
"RATIGAN"

No. 175 — and — No. 176

STUFFING BOXES



NO. 176
WITH SHUTOFF

NO. 175
WITHOUT SHUTOFF

Self-Oiling

Ratigan stuffing boxes incorporate modern engineering advancements that greatly increase safety and efficiency in oil field service.

Made of high grade electric steel and tested to 3,000 pounds pressure, they are the only self-oiling stuffing boxes on the market, receiving their lubrication directly from the pumping well. The inside of the box is removable, so that the device has two oil chambers. Another arrangement inside the body keeps these two chambers filled with fluid from the well, providing positive self-lubrication without depending on the human element.

Ratigan No. 175 and No. 176 Stuffing Boxes are identical except that the No. 175 has no shut-off feature. The No. 176 can be shut off while repacking the box, by tightening the screws evenly in the shutoff; but caution must be exercised, as the screws will have to be loosened before the well starts to pump. If not, the fluid will not get up into the stuffing box.

Advanced Design

The hole in the rubber is the size of the polished rod, while the hole in the metal parts of the body is larger, making the rod self-aligning — an important feature.

When the screws are not tight against the rubber, the stuffing box is free to function properly. For a further check on the fluid coming up through the bypass, the pumper may loosen the plug in the cap a little, and if the bypass is free the oil will flow immediately. If the oil does not come through, the screws in the shutoff are too tight. When repacking Ratigan Stuffing Boxes, both rubbers must be renewed. Instructions for installing are supplied to oil companies and supply stores on request, and are attached to all foreign shipments. When ordering specify size and type of thread, and size of polished rod.

All Ratigan Products Are Illustrated and Described in The Composite Catalog.

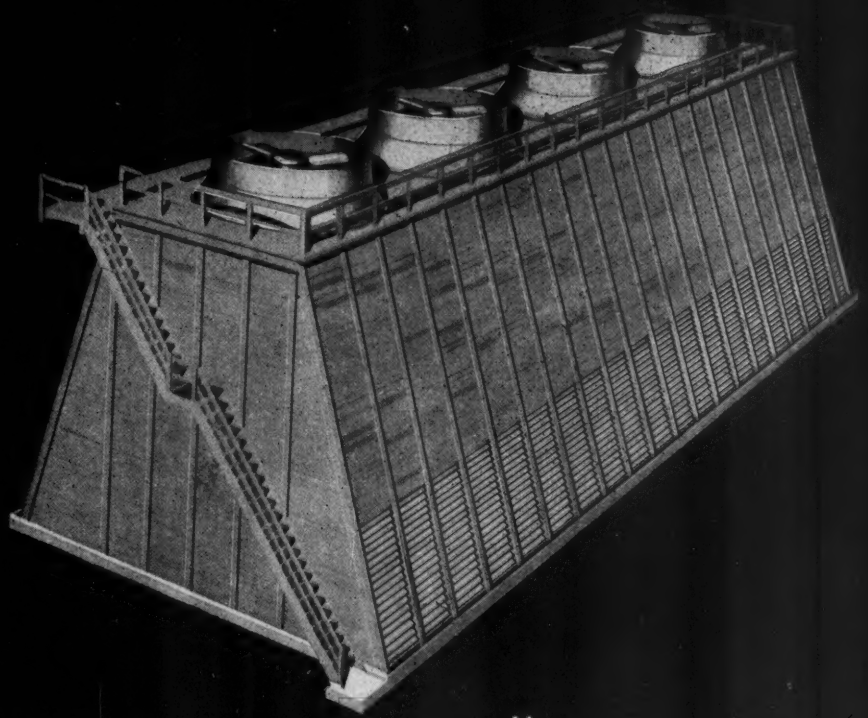
J. P. RATIGAN, Inc.

1213 Santa Fe Avenue — Los Angeles 21, California

Ratigan Products Are Distributed By Leading Supply Stores

THE *New* HUDSON

Top *Performance* COOLING TOWERS



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3 **LOWER OPERATING COST**

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HUDSON ENGINEERING CORPORATION

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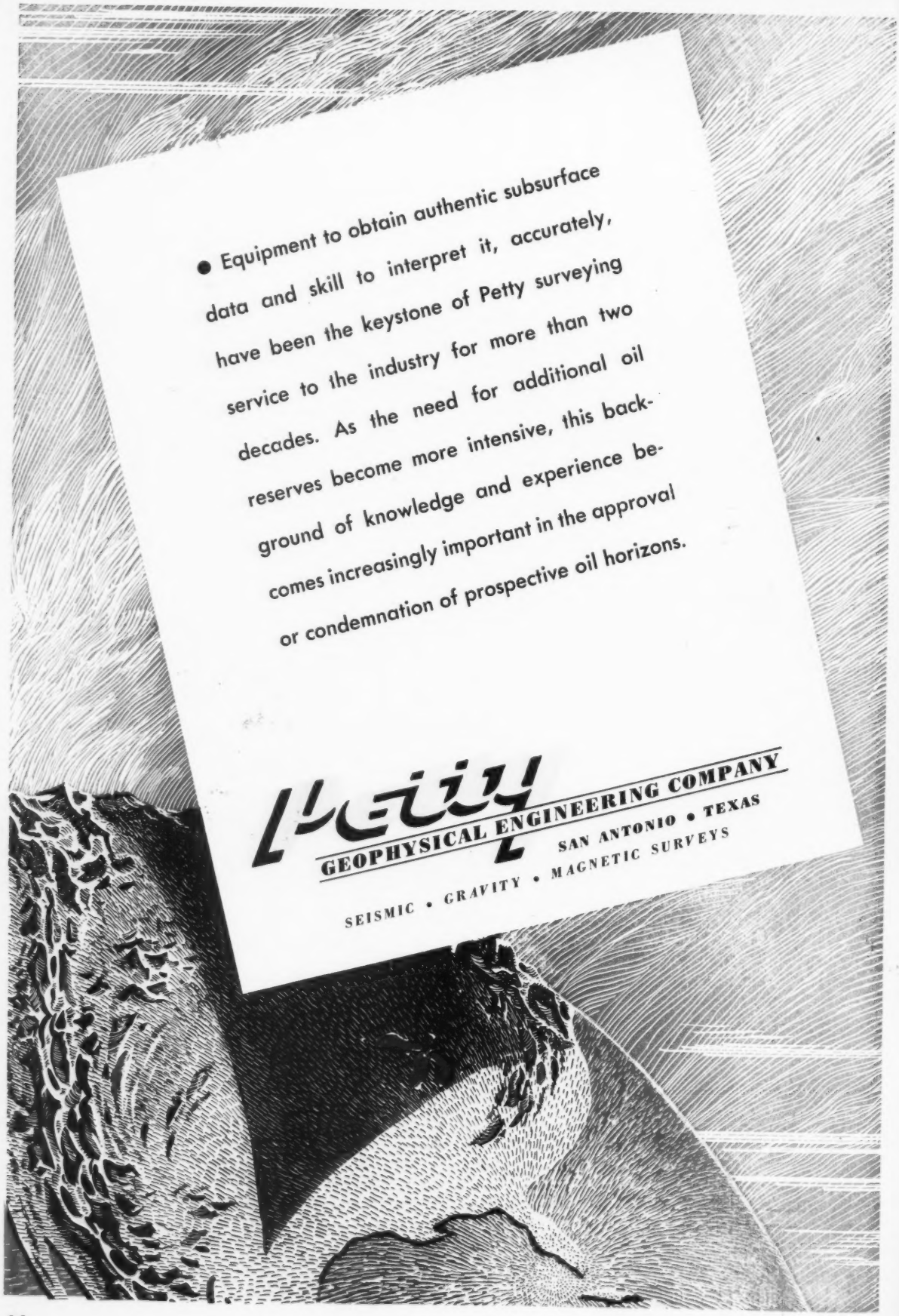
● Equipment to obtain authentic subsurface data and skill to interpret it, accurately, have been the keystone of Petty surveying service to the industry for more than two decades. As the need for additional oil reserves become more intensive, this background of knowledge and experience becomes increasingly important in the approval or condemnation of prospective oil horizons.
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WINTER TIME ON THE TANK FARM....

"VAREC" Figure 20 Vent Valve

Photograph courtesy Union Oil Company— Cutbank, Montana, Refinery.

As temperatures drop, vapor condensation and subsequent freezing can cause considerable damage to your storage tanks. Different operators take different precautions to protect their tanks, but in a survey made of practices in eighteen refineries located in cold weather areas, the overwhelming majority were found to depend entirely upon the proper functioning of "VAREC" Vent Units. These Units consist of "VAREC" Vent Valves and "VAREC" Flame Arresters.

"VAREC" Vent Valves (as illustrated above) are designed with a downward-facing weather snout that keeps the entrance of snow and ice to a minimum. The pallets, as well as the housing and other parts, are made of aluminum which has a high thermal conductivity and comes into very rapid equilibrium with the atmosphere. "VAREC" Flame Arresters are protected from snow and ice by the Vent Valves. The banks of the Flame Arresters are also made of aluminum for rapid temperature response as well as resistance to corrosion. The passageway through the banks have at least four times the free area of similar size pipe and allow good drainage and run-off. The tendency to freeze is therefore very low.

"VAREC" Vent Valves are fully listed by the Underwriters' Laboratories, Associated Factories' Mutual Laboratories, etc. They are truly your best year around guardians of storage tank safety.

Temperature changes are considered in the "VAREC" formula for determining the proper size vent units. A full explanation is given in the "VAREC" P-7 Catalog. Write for a copy on your letterhead today.

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The cost of practically everything used in refinery construction is going up. Prices may continue to rise; but *you can still afford to build or remodel and have a quick return on your investment.*

Assuming that the costs of material and labor may continue upward, *there is a known point to which you can safely project your costs* of construction. Treco can show you how much you can afford to spend and how you can define all costs, entering into the project. With all the variables accounted for; with the cost of construction, materials, labor and crude determinable it is possible to project the cost of operations to the degree of knowing how long it will take you to pay for your new facilities and what profits you can expect.

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Fifty-six Treco installations dot the nation and every Treco job has been a money maker for its owners.

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FABRICATING WELDED STEEL TUBING AND PIPE

NIKOH TUBE CO., 5001 S. Kedzie Ave., Chicago 32, Ill.

NIKOH **offers you these**

ultramodern manufacturing facilities

Nikoh Tube Co. is now producing welded steel tubing and pipe to meet all standard specifications for diameter, wall thickness, and finish. Our efficient manufacturing methods assure production costs among the lowest in the industry.

We are equipped to fabricate Nikoh Steel Tubing from ½" to 4" OD; Nikoh Thin Wall Plated Electric Conduit from ½" to 2"; and Nikoh Steel Standard Pipe from ¾" to 6" ID.

Nikoh products are accurate in wall thickness and size concentricity—easy to fabricate. The surface is smooth and uniform—ideal for coating or plating. We will gladly co-operate with you in problems of engineering and production.

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...modern plant design includes LUNKENHEIMER VALVES

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ARCHITECTS AND ENGINEERS
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Lunkenheimer Valves are available through Distributors in all industrial centers.

Housed in a strikingly modern, all-reinforced concrete, windowless building, the power plant of this manufacturer's forge shop is a picture of modern efficiency. The list of principal suppliers reads almost like "Who's Who" of power house equipment manufacturers.

Among these big names is that of LUNKENHEIMER . . . identifying high and low pressure valves that serve in multiple installations on lines and equipment.

The 85-year old LUNKENHEIMER reputation back of a widely varied line of quality valves has gained the confidence of planning and operating men alike. That's the reason LUNKENHEIMER VALVES are so often specified for modern installations . . . for long life, minimum maintenance and true, low-cost service.

***. . . More Power to Industry Through* LUNKENHEIMER VALVES**

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"QUALITY"
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The exclusive bearing and packing construction in Roofe Swivel Joints is designed so that cement, mud, caustic mud additives and other abrasives cannot reach the bearings. This means longer joint life, less maintenance, less rig down-time.

Study the cut-away of the Roofe Swivel Joint. High pressure, high temperature chevron packing is used throughout. A specially designed packing chamber (top of packing assembly) permits the lubricant to lift the lips of the packing the instant the pressure is applied. This feature prevents the possibility of leakage at any pressure. And lubricant can be applied under pressure.

The Roofe roller bearing design permits easy operation under high pressure . . . permits turning with less torque in any direction while under full working pressure.

Specify Roofe Swivel Joints. They are available now.

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A BUSINESS BUILT ON *Good* SERVICE

Up to par at below zero

In spite of a deep freeze during the winter of 1947-1948, "Caterpillar" Diesel equipment kept on doing its stuff to complete the new gas line being laid from the Austin Gas Storage Field near Big Rapids, Michigan, into Detroit. Mr. R. B. Somerville of the Somerville Construction Company, reports:

"On this job our 'Caterpillar' equipment really got a workout, but it really put out the work. And its speed and mobility meant a lot to us."

Long stretches of the line were laid in ground frozen as deep as five feet. These pictures show a "Caterpillar" Diesel D7 Tractor equipped with Hystaway digging the trench—and other sturdy "Caterpillar" units equipped with Trackson side booms stabbing and laying the pipe.

When there's a tough job to be done, you can count on "Caterpillar" Diesels to come through for you. And if you need service, you can count on prompt action from your able, well-equipped "Caterpillar" dealer.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR

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ENGINES • TRACTORS
MOTOR GRADERS
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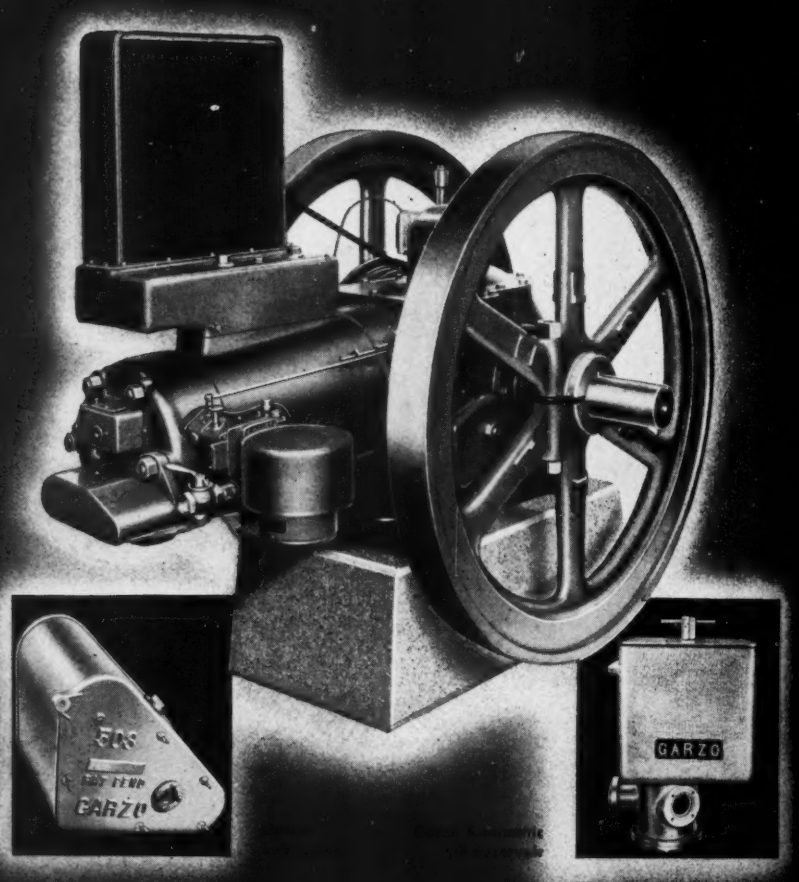
Equipped with Garzo Lubricat

Garzo Automatic Oil Reser



Check these outstanding features which make ZC slow-speed, horizontal heavy-duty engines the best buy in the field . . . Vapor cooling . . . roller bearings . . . extra heavy flywheels . ..self-oiling . . . fully enclosed . . . gas-gasoline carburetors . . . greaseless clutches with built-in shifter.

Equipped with Garzo Lubricators you get easier starting . . . cooler valve mechanism . . . better performance.

The Garzo Automatic Oil Reservoir eliminates shutdowns for replenishing oil . . . provides increased oil storage for longer operation without attention . . . makes easier, safer gauge readings.

Experienced operators have learned to appreciate these extraordinary features for pumping engine service . . . they have found that ZC will do a better job at less cost than other prime movers.

Less Cost Republic Offers

Heavy demand for crude oil and current high prices emphasize the need for modern and efficient production equipment to assure maximum output and increased profits.

REPUBLIC has the answer with its carefully selected and coordinated line of production equipment which meets every requirement from a single marginal producer to the most prolific producing lease.

For maximum efficiency at low cost call

REPUBLIC

"Your Supply Store"

Fairbanks-Morce ZC Pumping Engines are only one of the many lines of distinguished products associated with Republic Supply Service.

Republic Supply COMPANY

GENERAL OFFICES • • • HOUSTON 1, TEXAS

YOUR SUPPLY STORE

SERVES YOU FROM THESE POINTS

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WYOMING
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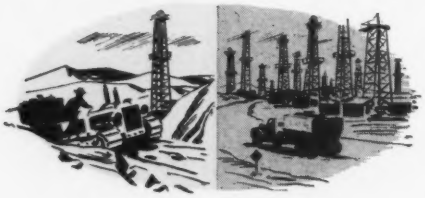
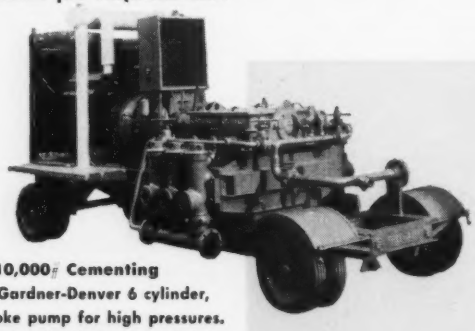
ICI engineered equipment

cuts cementing costs on every type of job



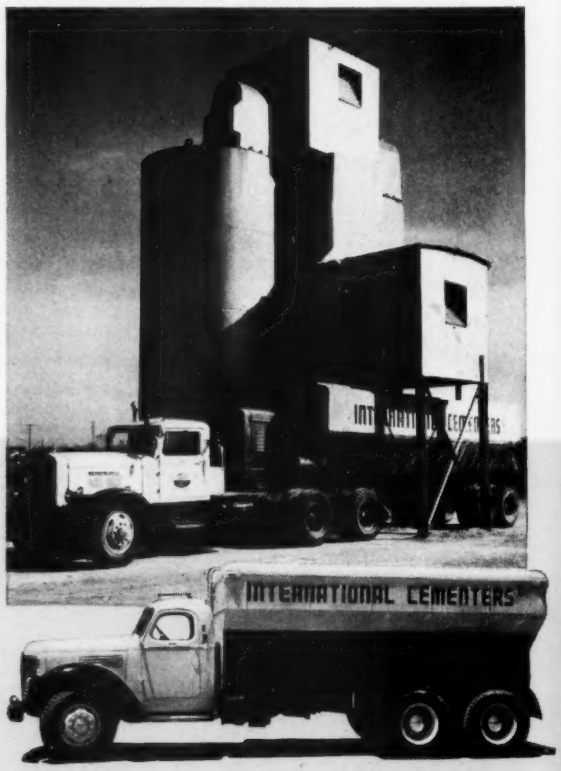
Designed to meet the specialized requirements found in overseas fields, ICI Engineered Equipment enables you to do your own cementing and pumping jobs with uniform controlled slurry and at a lower cost. Applicable to any type of cementing work, these ICI units are built in a wide variety of models to meet the requirements of every conceivable job in any terrain under any climatic conditions. Get the facts on these easy-to-operate, easy-to-maintain units today. Write us for the answer to your particular job requirement.



PL-7 10,000# Cementing Unit. Gardner-Denver 6 cylinder, 7" stroke pump for high pressures. An ideal well killing unit. Used for acidization, cement, mud or oil.

TYPE 102-T. A compact, "single pump" (either 3000 or 5000 psi) truck-mounted cementing unit. Heavy-duty truck engine operates the pump with the auxiliary engine operating the mixer, conveyor, and water proportioner.

BULK CEMENT BATCH PLANT. Bulk Silos may be installed in any combination of silo units. May include a central, completely automatic, weigh batcher to handle sand, gravel, and admixtures, as well as cement. The batcher speeds up delivery, reduces labor costs, and accurately weighs the quantity and flow of the desired material or combination of materials.



AIR ACTUATED BULK CEMENT UNIT. This outstanding 250 sack bulk cement unit is similar in design to the Model 1250-T. Instead of using the conventional screw conveyor, discharge is air actuated.

TYPE 1250-T. Bulk Cement Unit. A practical 250 sack, 3 axle unit with a gross weight limit of 40,000 lbs. "W" bottomed cement bin equipped with screw conveyor discharge.

Spanish-English Catalog sent on request. Movies on Cementing & Bulk Handling, with Spanish or English dialogue, available for safety meetings.

INTERNATIONAL CEMENTERS, INC.

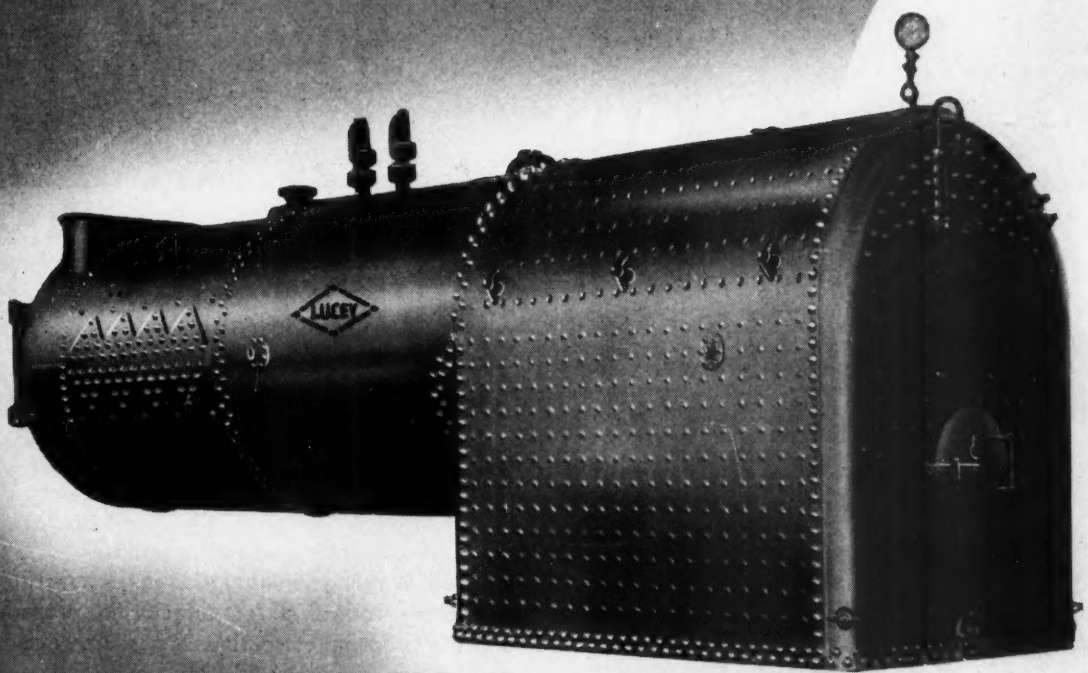
6505 Paramount Blvd., Long Beach 5, California, U. S. A.
Export Office: 420 Lexington Ave., New York City, U. S. A.
ICI, c/o Harold F. Towler, 9 Cavendish Square, London, W. 1, England
"T. I. P. S. A.", Avenida Rogue Saenz Pena 501, Buenos Aires, Argentina, S. A.

BEFORE YOU BUY

Get the Facts

ABOUT LUCEY BOILERS

- Lightest weight boiler per horse power
- Built of high-tensile steel
- Large all-welded fire box
- Double riveted mud ring
- Greater steam efficiency
- Greater fuel savings



And another fact is that in the oil country, you can do a better, safer job with Lucey, and do it with lower original cost and lower upkeep.

DISTRIBUTORS:

Lucey Products Corporation, Tulsa, Oklahoma
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EXPORT:

Lucey Export Corporation
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Broad Street House,
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LUCEY

LUCEY BOILER *and* MANUFACTURING CORPORATION

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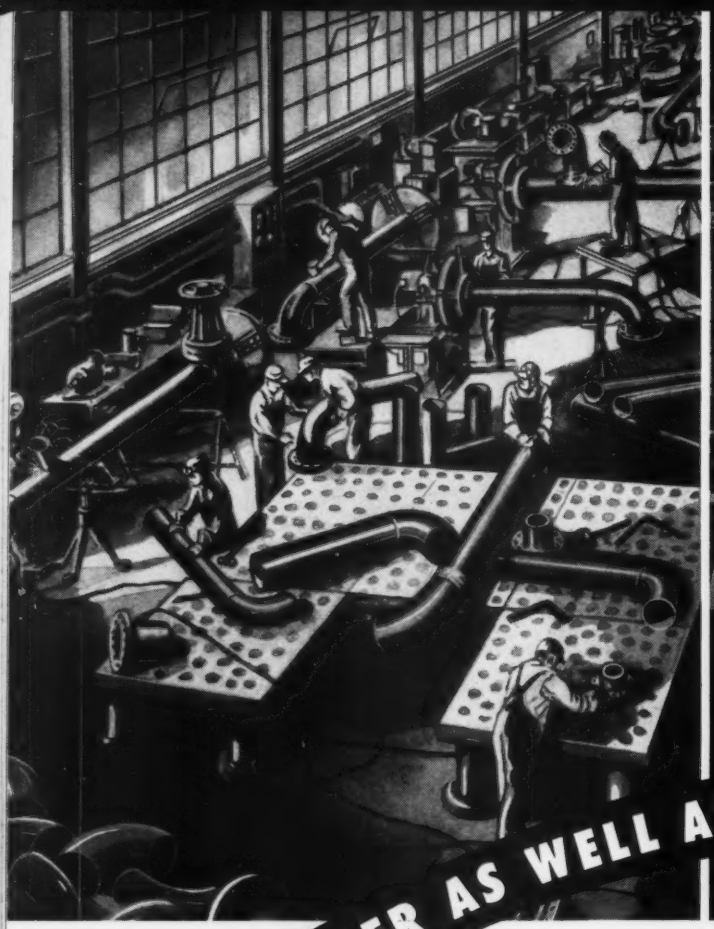

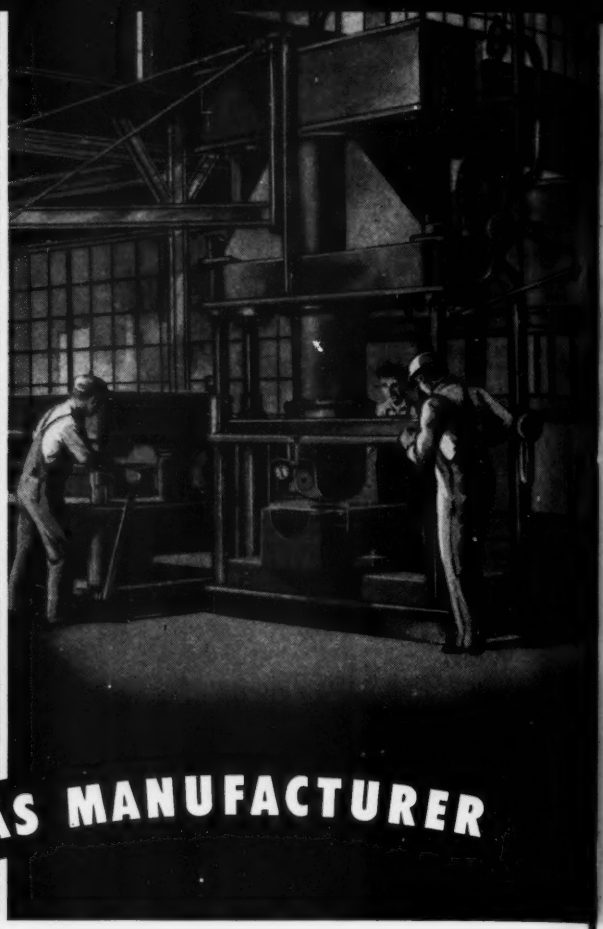

BEING USER AS WELL AS MANUFACTURER

MIDWEST

HAS THE "Customer's Viewpoint"

ON PIPE WELDING FITTINGS

The four Midwest pipe fabricating plants, and the Midwest Contracting Department are among the large users of Midwest Welding Fittings.

Hence, we have the "customer's viewpoint" when it comes to welding fittings. We know from our own experience what characteristics welding fittings must have to simplify piping layout . . . to reduce welding time . . . to improve piping design. The welding fittings manufacturing department always has the benefit of our extensive user experience.

This situation is one important reason for the high quality and exceptional practicality of all Midwest Welding Fittings. Also important are the laboratory control of manufacturing procedures and the program of continuous research in piping and welding problems.

For more information about Midwest Welding Fittings, get in touch with the local distributor or our nearest office.

MIDWEST PIPING & SUPPLY CO., Inc.

Main Offices: 1450 So. Second Street, St. Louis 4, Mo.

Sales Offices: New York 7—30 Church St. • Chicago 3—79 W. Monroe St. • Los Angeles 33 — 520 Anderson St. • Houston 2 — 229 Shell Bldg. • Tulsa 3—533 Mayo Bldg. • South Boston 27—426 First St.

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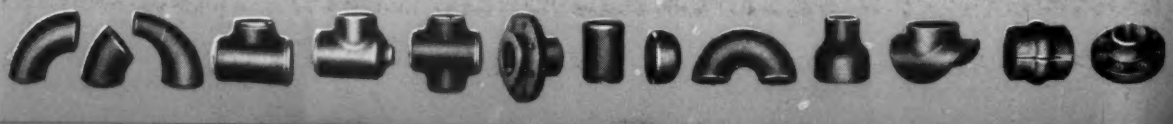
3481

WELDING FITTINGS IMPROVE DESIGN AND REDUCE PIPING COSTS



Twin Disc Clutches *on this job, too!*

Twin Disc Model CL Clutch.

There are four Twin Disc Model CL Clutches in the Winter-Weiss Portadrill transfer case. The Portadrill is used mainly for exploratory drilling and shallow oil production.

Exploratory drilling calls for speed . . . portable rigs that must move fast and drill fast.

Fast drilling demands a fast-acting clutch . . . like Twin Disc's Model CL. The CL is a heavy-duty friction clutch, yet small and compact . . . designed for high-speed installations demanding easy engagement and disengagement.

Overall dimensions are held to a minimum to conserve space. Action parts are hardened and ground. Wide friction surfaces are used. High grade molded asbestos friction material and highly finished surfaces on the clutch plates reduce wear to a minimum and assure smooth positive operation.

Twin Disc Model CL Clutches are available in one, two and three plate models, 5.5″ to 11.5″, with working capacities ranging from 12 to 125 hp. For complete information, write for Bulletin 120-C. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U.S. PAT. OFF.

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

it's here!

The NEW ALFCO DRY CHEMICAL FIRE EXTINGUISHER

has these outstanding advantages . . . Longer range at all climatic temperatures! . . . Longer duration of discharge at all climatic temperatures! . . . More complete discharge of Dry Chemical contents! . . . May be operated in any carrying position! . . . Scientifically designed nozzle provides for wider coverage of fire area! . . . Gas-tight, all-internal expelling gas connections! . . . Built-in safety disc! . . . Hose couplings neatly swaged to hose for greater strength, smarter appearance! . . . High hose-mounting position avoids compacting of Dry Chemical—affords neater appearance! . . . Easy to recharge without special devices or replacement parts! . . . Occupies only 7" x 9" floor space! . . . Lighter weight—only 42 lbs. when ready for use! . . . Alfco Dry Chemical is nontoxic, noncorrosive, nonconductor of electricity and will not freeze! Underwriters' ratings: B-1, C-1. Recommended for flammable liquid and electrical fires.

Overall height 30"; Floor space occupied 7"x9"; Weight of Extinguisher, empty 17 lbs.; Weight of Dry Chemical Charge 25 lbs.; Weight of Gas Charge 8½ ozs.; Weight of Extinguisher charged for use 42½ lbs.; Total Weight packed for shipping 45 lbs.; Nozzle Polished Aluminum 6" long; Hose and Nozzle lengths approx. 26"; Shell Drawn Silicon Bronze; Finish Baked Red Enamel with Chrome, and Polished Aluminum trim.

Write us for literature and for demonstration.

AMERICAN-LAFRANCE-FOAMITE Corporation

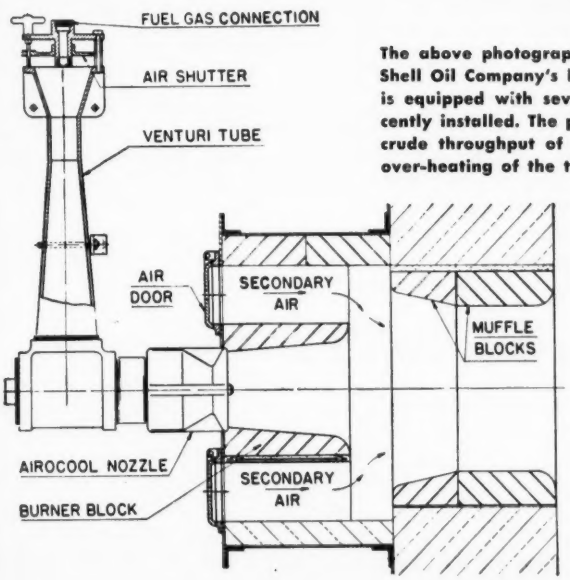
ELMIRA · NEW YORK · U·S·A

NATIONAL AIROIL FUEL OIL - GAS BURNERS

ANOTHER BIG JOB

Fired with . . .

"AIROCOOL" TANDEM COMBUSTION UNITS



The above photograph shows the front firing wall of a Topping Furnace in Shell Oil Company's large refinery at Houston, Texas. This gas-fired furnace is equipped with seven NATIONAL AIROIL TANDEM COMBUSTION UNITS, recently installed. The purpose of the new burner installation is to increase the crude throughput of the furnace—and to eliminate flame impingement and over-heating of the tubes in the convection section.

Prior to the change-over of burners, an experienced engineer from "National Airoil" was called in for consultation. Subsequent recommendations and layout drawings were soon received by Shell Oil, with the result that equipment was ordered exactly as recommended. Delivery of TANDEM UNITS were quickly made by "National Airoil"—and the installation was promptly and easily accomplished by Shell Co. from drawings supplied by us.

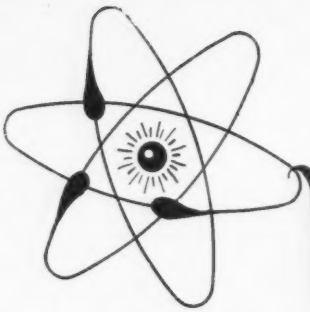
Advantages derived from burner change: **(1) Crude charge rate increased from the previous 19,000 Bbl/day to the present 22,000 Bbl/day, with ample furnace-firing reserve. (2) No flame carry-over into convection bank. (3) A uniform distribution of heat in the furnace. (4) Refinery staff are well pleased with the ease and simplicity of operation of the TANDEM UNITS.**

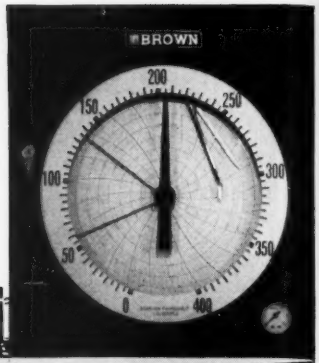
NATIONAL AIROIL BURNER CO., INC.

Main Offices & Factory: **1236 EAST SEDGLEY AVENUE, PHILADELPHIA 34, PA.**

Texas Office: 2512 South Boulevard, Houston 6

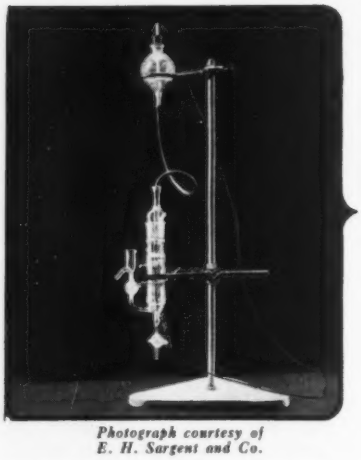
INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT





Whether ATOMIC STRUCTURE

BROWN *Electroniks*



Photograph courtesy of E. H. Sargent and Co.

Photograph courtesy of North American Philips Co., Inc.

WE PREDICT that these five measuring elements presage a phenomenal change in process control techniques during the next decade. The direct, continuous measurement and control of chemical composition will replace many of the inferential methods now in use. Analysis and measurement which formerly took days or hours of extremely skilled work has been reduced to minutes of routine procedure.

The Brown *ElectroniK* Potentiometer has been responsible for moving laboratory techniques into the plant. Greater accuracy, sensitivity and speed of response has made it a leader in the fields of chemical analysis and composition control.

THE POLAROGRAPH

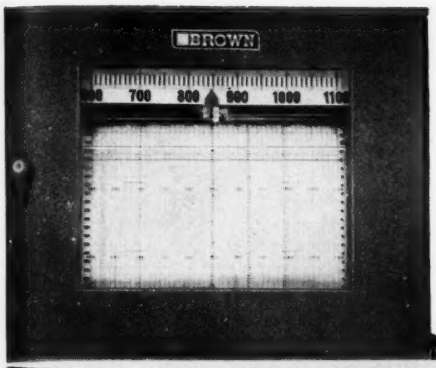
The Polarograph is an analytical instrument, both qualitative and quantitative, for determining the chemical constituents of either aqueous or nonaqueous solutions. Both in micro and macro analytical work, the Polarograph replaces tedious and slow wet chemical methods. The high speed of the Brown *ElectroniK* recorder facilitates obtaining a well defined analysis curve.

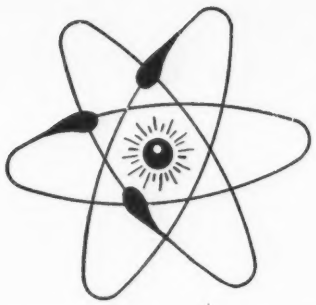
THE GEIGER-COUNTER X-RAY SPECTROMETER

Until recently, the time and technique required to perform and evaluate an analysis have limited the usefulness of an X-ray Spectrometer. Elimination of these two barriers is principally the result of two *achievements in electronics:* (1) The Geiger-Muller Tube, and (2) the Brown "Continuous Balance" High Speed Recording Potentiometer. Only ninety minutes are required to obtain a complete diffraction pattern with this high speed combination.

The *fast pen speed* of 4½ seconds across scale combined with the *high chart speed* of 120 inches per hour make it possible to spread out the record, contributing to convenience and accuracy in analyzing diffraction patterns.

BROWN *Electroniks*





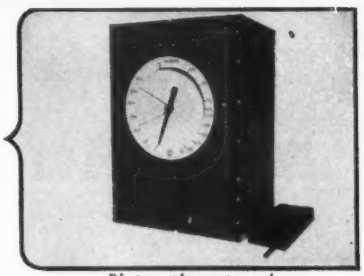
OR ULTRA VACUUM
Speed Research and Production

THE PIRANI THERMAL ULTRA VACUUM GAUGE

Many new processes require fast, accurate indicating, recording and controlling of ultra high vacuums. This is now practical using the combination of a thermal measuring gauge and the Brown *ElectroniK* Potentiometer.

Pirani gauges are available in ranges of 0 to 500 and 0 to 1,000 microns of mercury pressure absolute.

The fast Brown *ElectroniK* Potentiometer transforms these gauges into production tools.

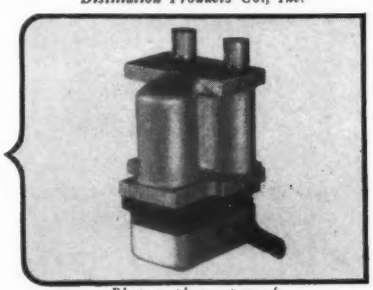


Photograph courtesy of Distillation Products Co., Inc.

THE GAS ANALYZER

The electronic measurement of combustible gases, vapors, oxygen and toxic gases is finding wide usage today.

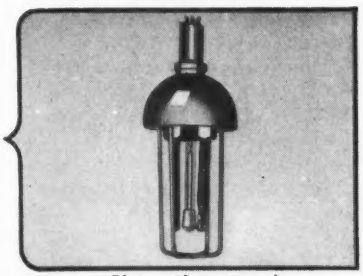
The cell illustrated analyzes combustibles present in a gas sample which is burned upon contacting a hot platinum filament in the analyzing unit, changing its electrical resistance. These changes are instantly detected, indicated and recorded by a Brown High Speed *ElectroniK* Potentiometer. Alarms may be sounded or control contacts may be utilized to close doors, start fans or initiate other corrective or preventive action.



Photograph courtesy of Davis Emergency Equipment Co., Inc.

THE pH ELECTRODES UNIT

The use of pH measurement and control in expanding sensationally into new processes and new industries. Standard Brown *ElectroniK* Potentiometers are available with pH ranges of 0-7, 3-10, 6-13, or 2-12 pH. The Brown *ElectroniK* Air-O-Line Controller has put pH control on a practical everyday basis. For further information, write to



Photograph courtesy of National Technical Laboratories

THE BROWN INSTRUMENT COMPANY, 4488 WAYNE AVE, PHILADELPHIA 44, PA.

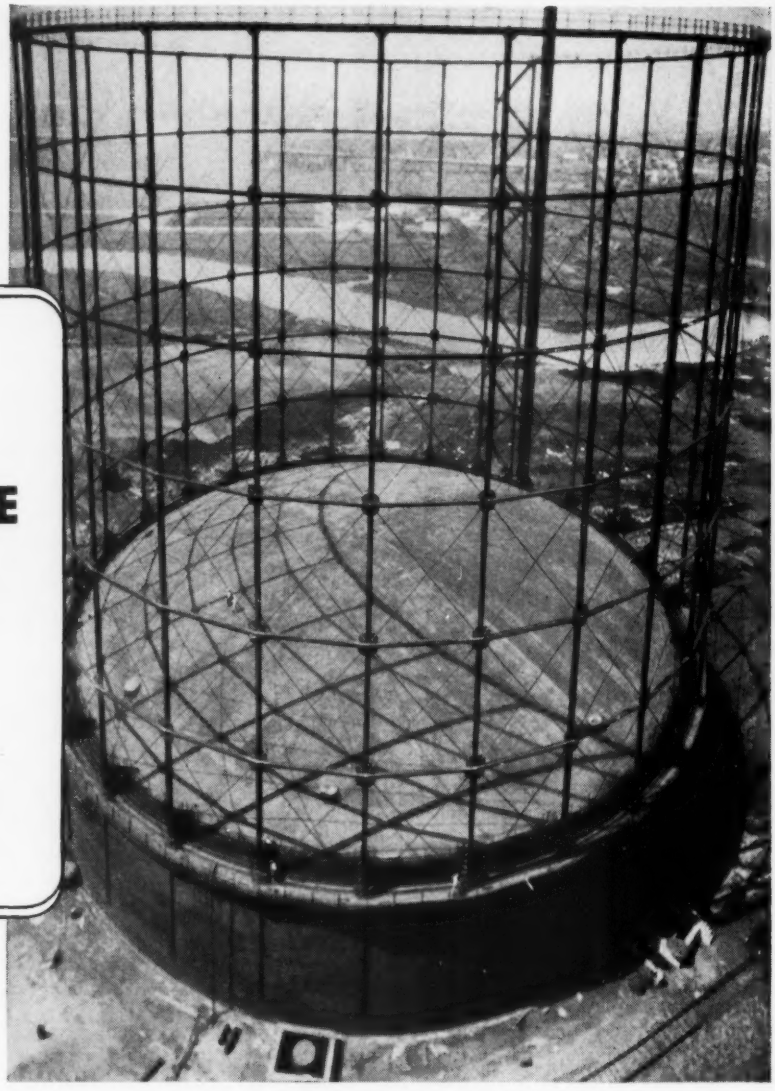
DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO.

Offices in principal cities of the United States, Canada and throughout the world.

POTENTIOMETERS

OPERATE ON "CONTINUOUS BALANCE" PRINCIPLE

CROWNED WITH AN ACRE OF INVISIBLE TOLERANCES



Here's the world's largest all-welded, wet-seal gas holder —10,000,000 cubic foot capacity.

Its crown, so smoothly rounded—and over an acre in area—is welded, inside and out, to tolerances so small that the assembly looks like a commercial flanged and dished head. Why? To insure perfect drainage at all times and to eliminate water pockets that are the prime factors in starting corrosion.

Such safeguards are typical of the plus values built into every Stacey Brothers holder. They're both the result—and the cause—of our unsurpassed record of experience in All-Welded Gas Holders. We've not only built the largest all-welded wet-seal holder, but we've built *more than any other company*. Since we first introduced the famous All-Welded Panel construction, now accepted as a standard in the industry, we've built 77 in sizes ranging from 100,000 cubic feet to 10,000,000 cubic feet—and an even greater number of the smaller sizes.

This experience can mean money to you—dollars saved in initial construction, in uninterrupted trouble-free service, in minimum maintenance. Better get the full facts now; ask for Bulletin W-45. If you prefer, we'll be glad to present our story in person—and quote on your requirements. No obligation, of course.

STACEY BROTHERS GAS CONSTRUCTION CO.
One of the Dresser Industries
5535 VINE STREET • CINCINNATI 16, OHIO

For an interesting illustrated 50 page catalog on Stacey Brothers Patented, All-Welded, Panel-Type Holders, write for Bulletin W-45.

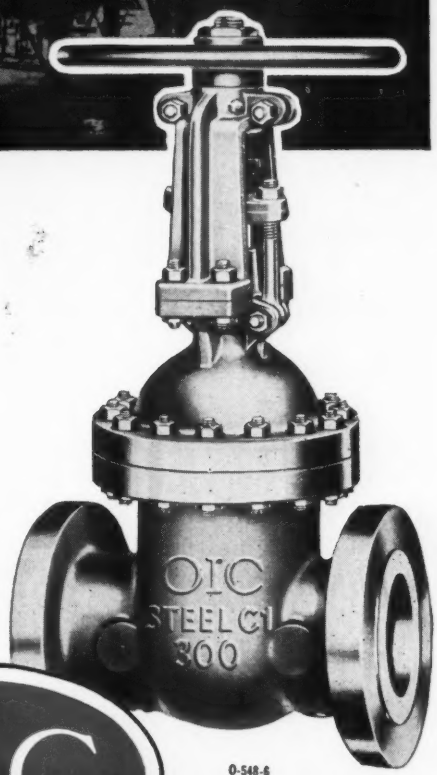
Stacey Brothers
ALL-WELDED GAS HOLDERS

WHEN PRESSURE'S AT A PREMIUM!

OIC

SETS THE PACE IN VALVES

Keep pressures up and costs down by guarding your lines with OIC, the Valve that's built for *longer-lasting steady pressure!* OIC Steel Gate Valves are the product of painstaking research — precise calculation of flange dimensions, bolting requirements, and gaskets for pressure-tight sealing with a wide margin of safety . . . streamlined design for free and easy flow! A few quick, easy turns of the handwheel slides the heavy I-beam wedge smoothly down between integral body guides for a positive, leakproof closure, or draws the wedge up entirely clear for a smoother, *faster* flow, free of pressure-cutting turbulence!



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OIC Valves save you time by keeping flow to a maximum. Save you labor by decreasing maintenance. *Save you money* by eliminating excessive pumping.

OIC VALVES

STEEL • IRON • BRONZE

THERE'S VALUABLE INFORMATION IN THE BIG 248-PAGE OIC CATALOG

Send for your free copy of OIC's fact-packed Valve Catalog. You'll find it filled with valve data and specifications useful to have at your fingertips. Just write, giving your name, firm, and address to The Ohio Injector Company, Wadsworth, Ohio.

MARSH GAUGES

Under the grind
of daily service
Marsh Gauges
stand out
as the kind that
maintain
their accuracy.

JAS. P. MARSH CORPORATION
DEPT. L, SKOKIE, ILLINOIS

The Jas. P. Marsh line includes gauges especially designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, pumps, Reid vapor bombs, scrubbers, separators, mud pumps, stills, towers, and other applications including oxygen and welding gauges.

TWO ROTARIES THAT RATE *TOPS WITH OIL MEN*

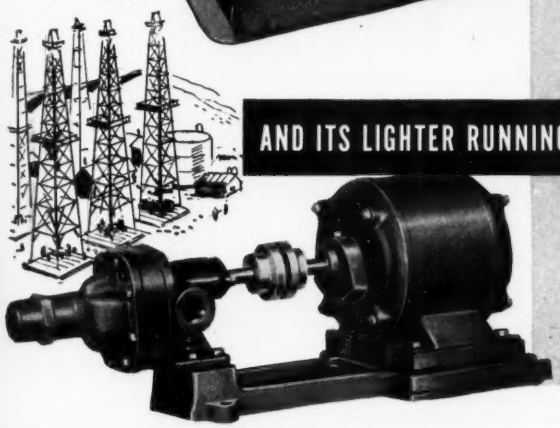
Worthington Rotary Pump, Type GR, engine drive. Capacities to 5,000 gpm. Pressures to 500 psi. Available in a wide variety of drive arrangements, and with steam or water jackets.

A HEAVY-DUTY VETERAN...

IT takes a lot of unbeatable performance records to establish a worldwide reputation such as the Worthington Rotary Pump, Type GR, has enjoyed for many years. That's why today, in oil fields and refineries all over the globe, you find GR's the first choice for the broadest range of non-corrosive, non-abrasive liquid handling. Features like improved double-helical gears, inboard bearings and mechanical seals for overhung drives make an impressive design story. Read all about them in Bulletin W-487-10B.

AND ITS LIGHTER RUNNING-MATE...

JUST as thoroughly "proved in action," this newer and lighter Worthington Rotary Pump, Type GA, is an equally dependable performer in the small capacity, low pressure class. Quiet, efficient herringbone gears and four large, pressure lubricated bearings feature the simple, rugged design that assures years of low-cost, trouble-free service. Get the details in Bulletin W-484-B-1.



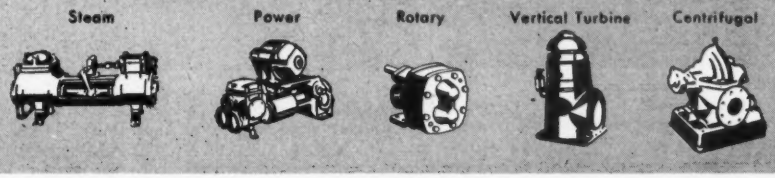
Worthington Rotary Pump, Type GA, motor drive. Capacities to 51 gpm. Pressures to 100 psi. Foot or flange mounted, with or without relief valve.

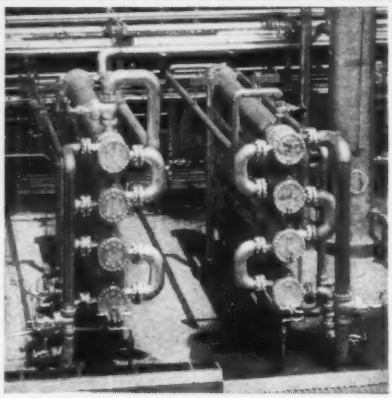
WORTHINGTON

In these two amazingly efficient, economical rotary pumps you see the results of long, careful study of the oil industry's special requirements. Whether your own needs call for the GR, the GA or any other type of pump, remember this fact recognized by oil men everywhere . . . *There's more worth in Worthington! Worthington Pump and Machinery Corporation, Reciprocating Pump Division, Harrison, New Jersey.*

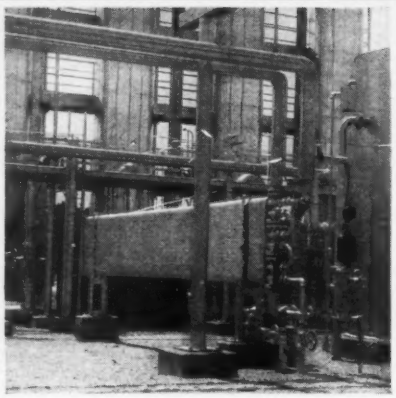
PG-6

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

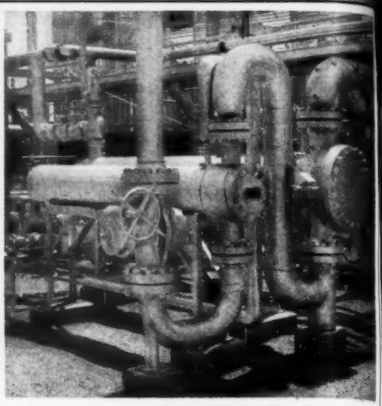




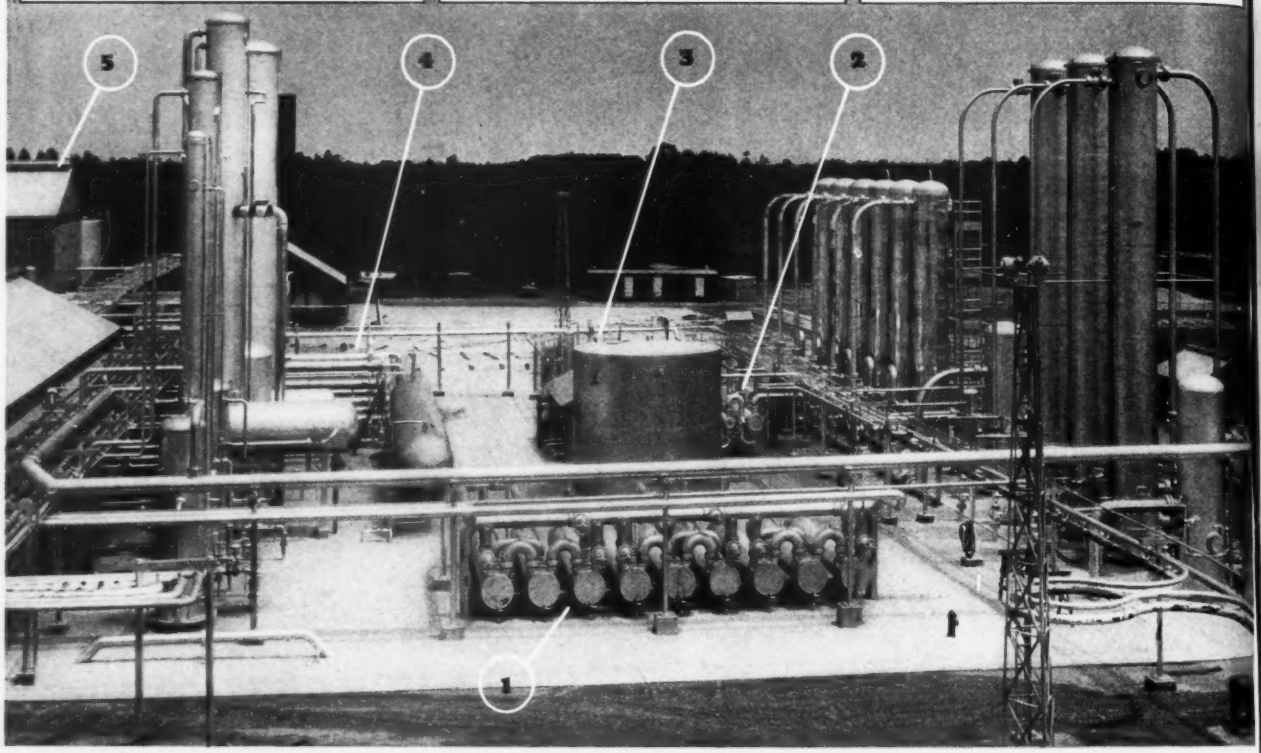
4. G-R Tubular Still Feed Exchangers and Preheaters



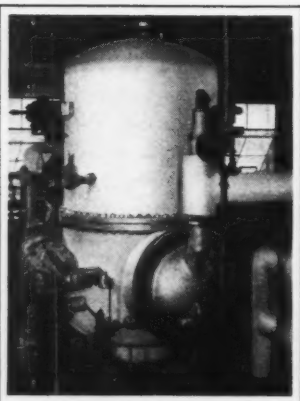
3. G-R Twin Bare Pipe Section Boiler Feedwater Exchangers



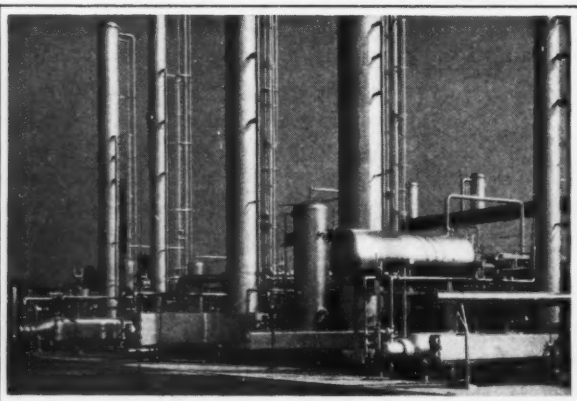
2. G-R Tubular High-Pressure Gas Heaters for regeneration of dehydrating material



1. General view of portion of the Feasel and Kinsey Plant of Chicago Corp., at Carthage, Texas, showing a row of nine G-R Tubular Units used as main exchangers in the foreground



5. G-R Bentube Evaporator for distilling the feedwater make-up for the high-pressure boiler plant



G-R Kettle Type Reboilers and G-R Twin G-Fin Section Fractionator Column Feed to Product Exchangers

Two of more than 60 G-R Atmospheric Bentube Sections for all cooling services, including extremely high-pressure gas cooling

GRISCOM-RUSSELL: PIONEERS IN HEAT TRANSFER APPARATUS

G-R

Heat Transfer Apparatus

again used in this Chicago Corporation Plant

The Chicago Corporation has had lengthy experience with G-R Heat Exchangers . . . they have successively installed many G-R units of various types at their Wardner, Coastal and Gulf Plains Recycling Plants.

The excellent performance of these previous G-R installations has justified their continued use of G-R Heat Transfer Apparatus throughout the new Chicago plant at Carthage, Texas. Here, as shown in the illustrations, a total of more than 100 G-R units of the following types have been installed:

Atmospheric Bentube Sections
High-Pressure Gas Heaters
Tubular Exchangers
Kettle Type Reboilers
Twin G-Fin Sections
Twin Bare Pipe Sections
Bentube Evaporator

This installation indicates two significant points of importance to *every* user of heat transfer apparatus:

1. The many different types of G-R equipment . . . an exactly suitable design for every heat transfer requirement
2. The outstanding success of G-R installations . . . winning repeat orders and exclusive standardization on G-R equipment

Bulletins describing G-R apparatus for heat transfer services in which you are interested will be sent on request.

THE GRISCOM-RUSSELL CO.

285 MADISON AVENUE, NEW YORK 17, N. Y.

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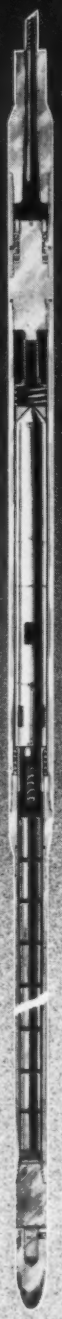
GRISCOM-RUSSELL



Half Section of Surwel Multishot Surveying Instrument

ACCURATE SURVEYS

Before Reconditioning

PAY DIVIDENDS

With current heavy demand for crude oil and high prices, now is the time to rework those old wells for increased profits! And the first step in such a program should be the accurate determination of well inclination and bottom-hole position by a complete survey.

This can be done quickly and economically with Surwel (Gyroscopic) Multishot Surveying Service which is widely used to survey both new and old, cased or open holes.

The patented Surwel Surveying Instrument provides permanent photographic records of the inclination and direction of the hole at any depth.

It is self contained, operates automatically at pre-set short time intervals both going in and coming out of the hole. Records are obtained by camera which photographs the direction of the gyroscopic indicator and the degree of inclination. The correct course of the well can be plotted from this information and the customer is furnished with the sustaining data.

A complete survey unit with trained operators is ready to serve your needs.

WRITE, WIRE OR TELEPHONE OUR NEAREST SERVICE POINT FOR COMPLETE INFORMATION

★SURWEL SERVICE ★SYFO CLINOGRAPH ★E-C INCLINOMETER ★NON-MAGNETIC DRILL COLLAR

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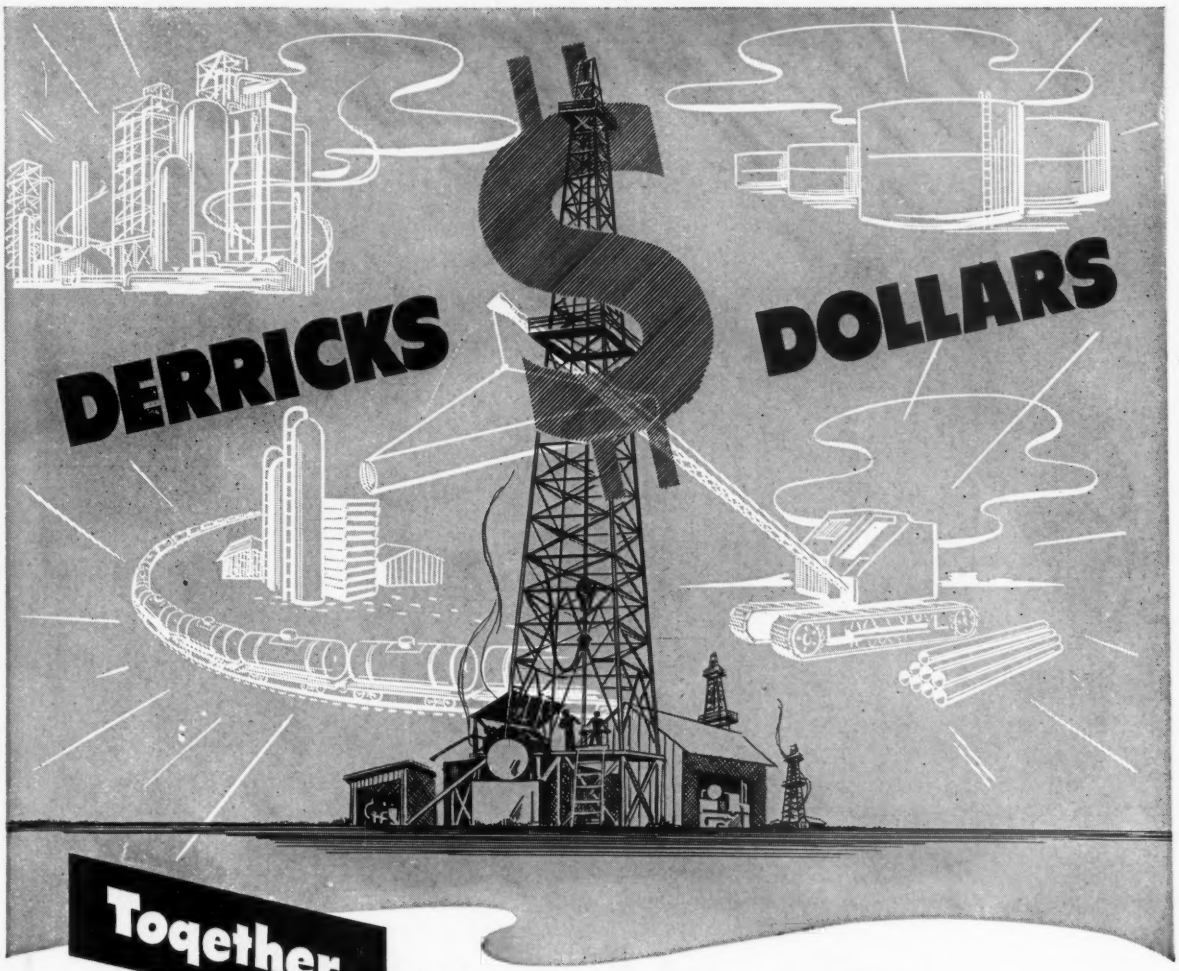


...they serve progress

The history of the Oil Industry is one of continuous research for the improvement of their product . . . for the development of new by-products which contribute to better living.

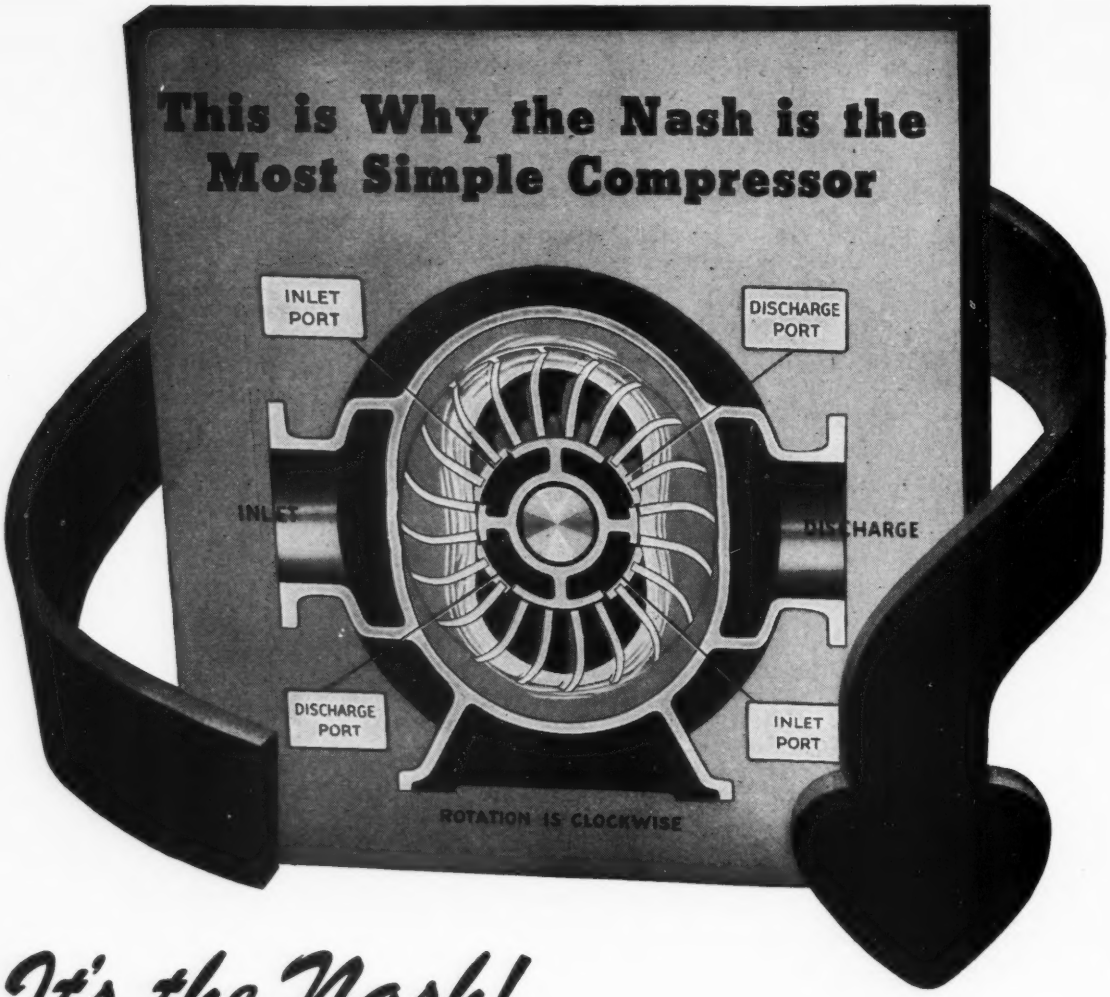
The uses of oil have been multiplied many-fold since the early days when kerosene and axle grease were its principal products. Today, in addition to high octane gasolines, lubricants, fuel oil, paraffin, oil provides the raw material for the manufacture of synthetic rubber, plastics, paints, alcohols, solvents and a long list of other products which are serving the living standards of the people of America.

Many of the millions of dollars required by the Industry for the improvement and development of their product have come from Texas banks. The City National Bank of Houston, located in one of the Nation's greatest oil centers and actively engaged in Oil and Gas financing invites a discussion of your financing requirements. The Oil and Gas Department's broad experience in the industry . . . their knowledge of its financial requirements assures a comprehensive understanding of your problem which leads to prompt action.

THE City National BANK OF HOUSTON

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

This is Why the Nash is the Most Simple Compressor



It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request.

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY
322 WILSON, SO. NORWALK, CONN.

Facts you should know about GOODALL FLEXO ROTARY HOSE AND REPAIR SERVICE

It is well established that Goodall Flexo Rotary Hose — with Barney Couplings — has the longest life of any rotary hose combination ever developed. In addition, Goodall maintains a repair department in Houston that further increases the service you get from this outstanding hose.

In the event that the hose ruptures behind the coupling—the most common cause for rotary hose replacement—it can be easily repaired at low cost by simply resetting the coupling in good hose. The loss in length may be as little as 18 inches. Sometimes this inexpensive repair job may save the hose several times before it finally becomes too short.

In case of damage near the center of the hose (or if the usable hose is too short) why not have the couplings reset in short lengths for use as vibrator hose at a considerable saving?

Then, when the hose is completely used up, the Barney Couplings still have a trade-in value. That's another important saving that makes Goodall the first-choice rotary hose.

Goodall is the only rotary hose manufacturer to offer such service. This service, combined with the advanced features of Goodall "Flexo" Rotary Hose and Barney Couplings make Goodall the favorite with oil companies and drilling contractors everywhere.

Stocked at all distribution points

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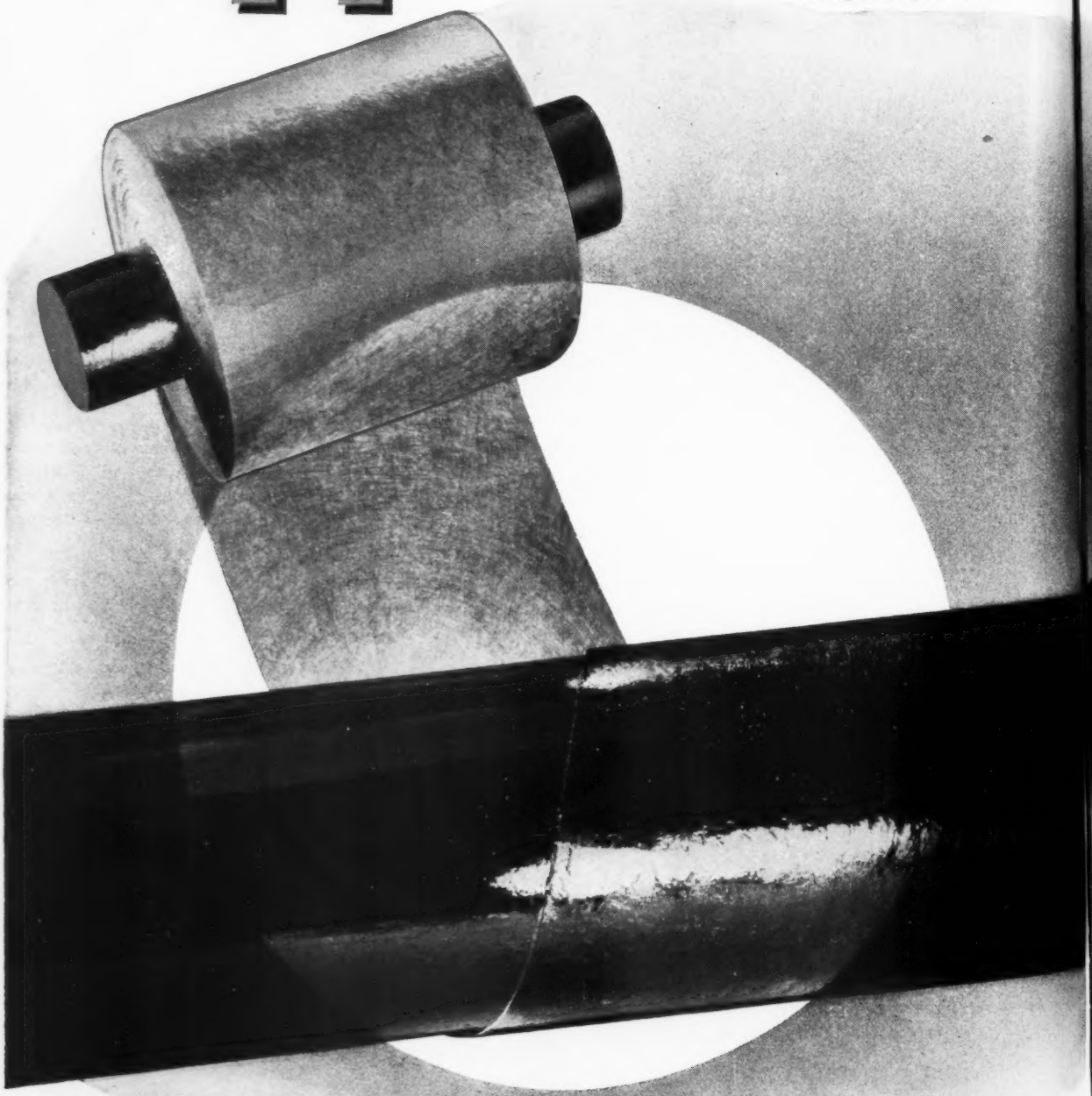
14 reasons why FIBERGLAS*.....

A Product of Owens-Corning Fiberglas Corporation



Write today for your copy of the new manual now on the press. Owens-Corning Fiberglas Corporation, Department 957, Toledo 1, Ohio. Branches in principal cities. In Canada: Fiberglas Canada Ltd., Toronto, Ont.

THE TREND IS TOWARD **FIBERGLAS** FOR UNDERGROUND

*FIBERGLAS is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

...PIPE WRAP gives better underground corrosion protection...*at lower cost*

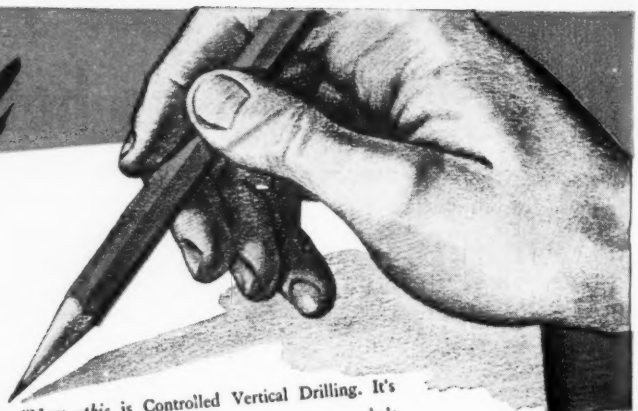
1	**ONE CONTINUOUS ROLL**—Fiberglas Underground Pipe Wrap comes in rolls up to 1,000 ft. long, unspliced—longest on the market.
2	**FIBER COUNT** of Fiberglas Underground Pipe Wrap is greater per unit area than any on the market. Closer bond gives better protection.
3	**GREATER IMPACT STRENGTH**—Fiberglas Underground Pipe Wrap offers greater resistance to stones and other causes of holidays when filling in laid lines. Positive protection.
4	**PRICE IS COMPETITIVE**—Fiberglas Underground Pipe Wrap costs no more, yet installation costs are more economical—and the job lasts longer.
5	**PROVED IN USE**—Almost 10 years have elapsed since the first pioneering application of Fiberglas was made by Owens-Corning—and it's still going strong.
6	**LEADING CHOICE**—Fiberglas Underground Pipe Wrap, first glass mat to be offered, is first choice of users.
7	**AVAILABILITY**—To meet the ever-increasing demands for Fiberglas Underground Pipe Wrap, Owens-Corning production facilities have been further enlarged by the opening of a new plant in Kansas City.
8	**NATIONALLY KNOWN**—So widely known is Fiberglas Underground Pipe Wrap that this product, made by Owens-Corning, the largest manufacturer of its kind in the world, has become a standard of the industry.
9	**ACID-RESISTANT**—The basic glass fibers of which Fiberglas Underground Pipe Wrap is made are inorganic. Glass is unaffected by all soil acids.
10	**HEAT-RESISTANT**—Fiberglas Underground Pipe Wrap is not affected by hot applications (up to 450° F.) of the commonly used impregnants.
11	**MOISTURE-RESISTANT**—Fiberglas Underground Pipe Wrap is resistant to the effects of moisture. It will not rot or decay or corrode adjoining metal surfaces. It does not contribute to drying, flaking or cracking of the bitumen coating.
12	**VARIETY OF AVAILABLE SIZES**—Fiberglas Underground Pipe Wrap is made in widths from 2″ to 18″, 75′, 450′ and 1,000′ rolls on order, and in .015″ and .025″ thicknesses for yard, mill, hand and field wrapping.
13	**HIGH POROSITY**—Fiberglas Underground Pipe Wrap is manufactured with a carefully controlled porosity—to provide uniform bleed through of coatings and elimination of entrapped air or moisture during application.
14	**EASILY APPLIED**—Fiberglas Underground Pipe Wrap is light in weight—easily transported. Its flexibility and strength permit smooth application with easy handling.

PIPE WRAP

OWENS-CORNING
FIBERGLAS

UNDERGROUND
PIPE WRAP

"Maybe this will help explain CONTROLLED VERTICAL DRILLING"*



"So they said down at the office that I know something about drilling vertical wells, eh? Well, I ought to . . . I've drilled a lot of 'em.

"First off, let's get it straight what Controlled Vertical Drilling is *not*. It's *not* this. Even if a hole like this bottoms dead center under the rotary, it's *not* a "controlled vertical" well. It never has been, and never will be anything but trouble. Trouble drilling, with extra bits, maybe twist-offs, keyseating, washouts, fishing jobs. Trouble running casing and cementing. And trouble every year it is on production.

"Then there's this — Controlled Directional Drilling, where you're trying to hit a spot some distance from the derrick . . . out under water, say. Reason I mention it is, a lot of men get confused. They think Controlled Directional Drilling and Controlled Vertical Drilling are the same thing used two different ways. That's wrong. They're two entirely different methods. And the methods and equipment used in one won't work in the other—just remember that!

"Now—*this* is Controlled Vertical Drilling. It's where the driller makes plenty of hole because he's always using the correct weight and speed—*straight* hole because he never lets it get beyond the critical angle. Critical angle? That's the angle at which the forces which cause hole deflection really become established. It varies with the size of the hole, drill collar, and so on, but it's always small. Some men figure it something less than 2 degrees: me, I'd like to keep the angle of the hole less than 1 degree. Any deviation less than that is easy to correct, but you can buy yourself a lot of grief if hole deflection gets beyond that angle.

"How do you know what the hole's doing? A smart question, because that's the heart of Controlled Vertical Drilling. The driller's *got* to know what's happening every foot of the way. And the only way to know is to take frequent readings with an inclination recorder that's accurate down to small fractions of one degree. I use a Totco Recorder myself—been using it for years—because it *is* accurate to less than an eighth of a degree, because I can *always* depend on its readings, because it's simple to use, and can be dropped down the drill pipe, run on measuring or sand line, or with retractable coring equipment.

"That's the whole basis of Controlled Vertical Drilling . . . take frequent readings with a reliable recorder; never let hole deflections get beyond the critical angle; use the information the recorder supplies as a guide for correct weight and speed to cut each formation efficiently. That's the way to drill *better* wells, drill 'em faster, drill 'em cheaper."

*Based upon the actual statements of hundreds of drillers and drilling superintendents in all parts of the country, and in many foreign fields.

TOTCO

TECHNICAL OIL TOOL CORP., Ltd.

1057 N. LA BREA AVENUE • LOS ANGELES, CALIFORNIA

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IF IT'S AN OIL LIFTING PROBLEM...

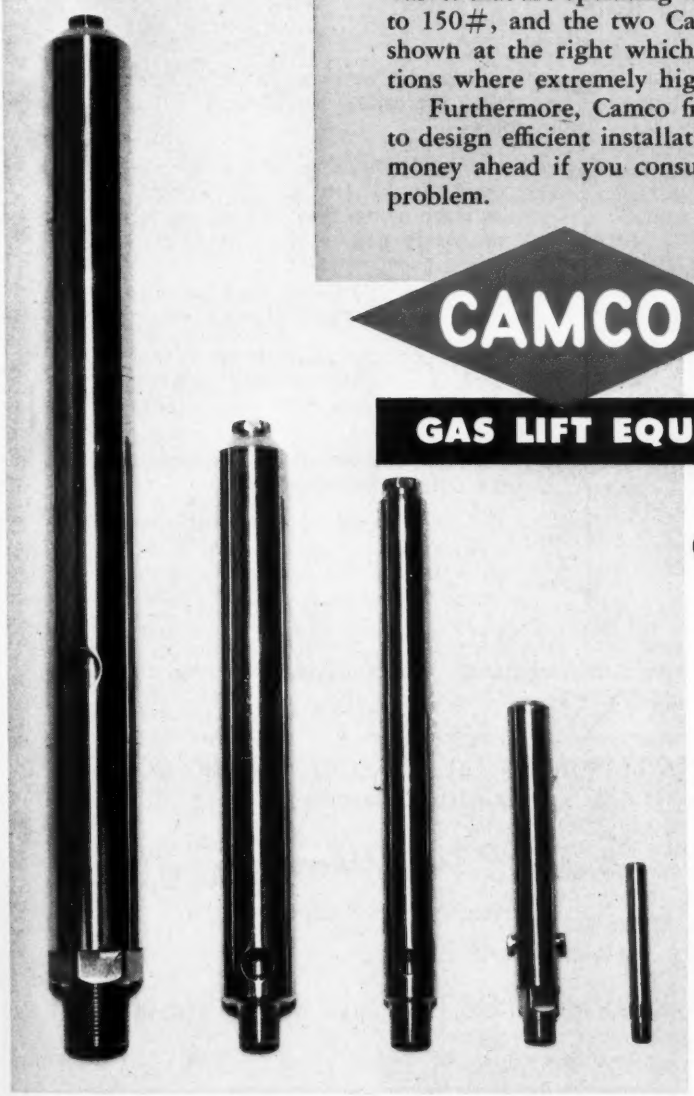
CAMCO HAS THE ANSWER

In the Camco family there are valves that have done an outstanding lifting job under nearly every possible set of conditions.

Take the new Camco Type D Valve shown at the left. Recently completed field tests have proved that this valve gives excellent efficiency on low-fluid-level wells previously considered suitable only for pumping. For example, in one low productivity well with a fluid level at around 5,000 feet, the injected gas pressure was reduced from 500# to 215# and the gas fluid ratio was reduced by 50%. Think of the economy this producer is enjoying by doubling his lifting efficiency and at the same time reducing the required field pressure by more than half.

Then there are the Camco Type C and Type B Bellows Valves that are operating with opening pressures from 1600# to 150#, and the two Camco Type "S" Differential Valves shown at the right which are most successful under conditions where extremely high production is required.

Furthermore, Camco field engineers have the experience to design efficient installations for every condition. You'll be money ahead if you consult Camco on your next oil lifting problem.



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THE SUPREME TEST OF ANY OIL FIELD SERVICE

Has It Met the Demands and Anticipated the Needs of the Industry?

As drilling and production men, you set a fast pace for any supplier of service or equipment. How well has Halliburton kept abreast of your needs, and how much has its own research contributed to your progress? Therein lies the real test of any service. Let the record speak for itself:

To meet vastly expanded demand, you went farther and farther afield in your search for oil

. . . and, wherever you went, you found Halliburton service available.

You penetrated deeper and deeper into the earth's surface

. . . and found Halliburton ready with equipment and methods designed to meet deep-well pressures and temperatures.

In your quest for new sources of oil, you even went to "sea"

. . . and found at your service special marine cementing barges equipped for offshore operations.

You sought new ways of reducing risks, increasing yield and cutting costs

. . . and found in Howco-developed tools (multiple-stage, squeeze cementing, etc.) a tested means to your end.

You sensed, perhaps, that handling cement in sacks was wasteful

. . . and found Halliburton ready with a network of bulk cement plants and transport equipment.

As drilling costs went up, you became increasingly cost-conscious

. . . and found that of all the services and supplies you buy, only Halliburton cementing service costs less today than in 1924.

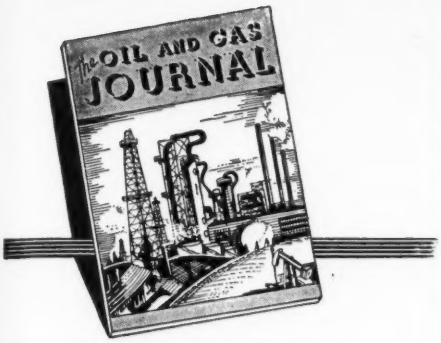
Halliburton has grown big because it has vigilantly and consistently geared its operations to the needs of the industry it serves.

HALLIBURTON OIL WELL CEMENTING CO.
Duncan, Oklahoma

Erle P. Halliburton

Chairman of the Company

THERE IS NO SUBSTITUTE FOR EXPERIENCE IN OIL WELL CEMENTING



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JOURNALLY Speaking

Extra Special

THIS is a special issue of our favorite oil publication, being the annual International Issue, and also an extra issue. This comes about through a fluke of the calendar which put 53 Thursdays into 1948, which means that the subscribers get 53 issues this year although they paid for only 52.

If that weren't enough of a bargain, this extra special issue is crammed full of material telling just all about the oil of the world, its reserves, output, refineries, supply, and demand.

All of it was prepared expressly for this issue, mostly by our own staff but with important contributions made, at our request, by recognized experts. Work on this issue started early last summer, and it took a lot of planning and figuring to put all the stuff together and make it fit. But we think it was worth it and that this extra special issue will be used by a good many people through a good many weeks of 1949.

International Guide

JOURNAL-GUIDE to International Oil is the fancy label our editors stuck on the fancy map inserted into this issue, and it's a good title if you don't misunderstand it.

It won't tell you where to go to discover oil, but it will tell you where oil has been discovered, where it is refined, what routes it moves over, and a lot of other information valuable for quick reference. The boys upstairs worked long and hard over this map, and have reason to be proud of it.

Besides, this map will look mighty pretty hanging on your wall, what with its bright colors against the wide expanses of battleship-gray ocean.

Red Nickels

WE are indebted to our esteemed contemporary, Iron Age, for clearing up a mystery which has bothered us for some time, to wit: why we occasionally get nickels coated with red nail polish.

According to Iron Age, which we accept as unquestioned authority on matters metallurgical, proprietors of juke-box joints drop these in the slot when they want to liven up the premises and induce customers to follow suit. When the box is opened the red nickels are removed and don't count in the "take." Life is so complicated these days we're glad to have that problem solved.

The Argentine Way

OUR engineering editors turned the story down cold, but we are intrigued with a report from Argentina that dogs are being trained to patrol a gas pipe line in that country.

As we understand it, the dogs are raised on meat that smells like gas. Then they are turned loose on the right-of-way and when they detect a leak in the line they start digging. The scheme would seem to have merit, at least until the dogs get wise, but it isn't much of a compliment to the meat.

And Happy New Year

OF all the Christmas cards which reached our offices, and they can be measured by the bushel, we got the biggest bang out of one from Core Lab which contained a scientific dissertation on the permeability of fruit cake.

"In an attempt to correlate actual experimental results with theoretical calculations," Core Lab drilled plugs from fruit cake with a special cellophane bit but ran into trouble with the Dinosaur factor and sand content of West Texas fruit cake and the channeling effect of hard California raisins. The experimenters finally evolved a formula which only the long-haired engineers can appreciate, but before results could be checked a dog ate the samples. We look forward to resumption of the experiment in this neglected field of science next year.

Anyway, we thank all well-wishers for their Christmas greetings and wish the same to you.

Softening up a "tough" customer

DOWELL PARAFFIN SOLVENTS are first aid for production problems caused by paraffin deposits.

For a "tough" situation where paraffin deposits are gumming up the works, choose economical, time-tested Dowell Paraffin Solvents, designed to *increase production* in pumping or flowing wells by dissolving the toughest paraffin—even complicated by impurities such as salt and sand.

For example, the production of a dually completed, high-pressure well was cut by paraffin deposits in the tubing and annular space between tubing and casing. The well was shut in and Dowell Paraffin Solvent lubricated into the casing and tubing. The solvent was allowed to remain in contact with the paraffin deposit for several hours. *Result:* After one small Dowell Paraffin Solvent treatment, *the flow increased from 150 to 195 b.o.p.d.!*

Dowell Solvents have also proved effective in cleaning lead lines, tank bottoms, screens, liners, perforations and in rerunning rods.

For year-'round paraffin control, secure a supply of Dowell Paraffin Solvents from your nearest supply store or Dowell station. Ask for your free copy of "Time Proven Methods for Removal of Paraffin Deposits", an authoritative, handbook.

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TULSA 3, OKLAHOMA
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PARAFFIN SOLVENTS

Ask your nearest Dowell station for complete information on these Dowell services and products: Acidizing, Electric Pilot Services, remedial Plastic Service, Chemical Scale Removal Service for heat exchange equipment, Jelflake, Paraffin Solvents and Bulk Inhibited Hydrochloric Acid.

"Petroleum Promotes Progress"

Look to **DOWELL**

FOR OIL INDUSTRY CHEMICAL SERVICE

The OIL AND GAS JOURNAL

FOUNDED IN 1910 BY PATRICK C. BOYLE

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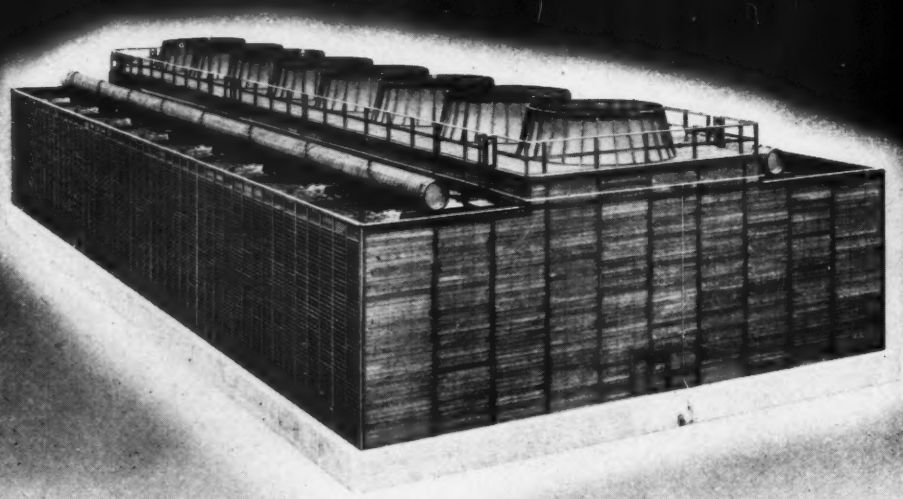

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THE OIL AND GAS JOURNAL

World Outlook

THE surveys of the present world-wide petroleum situation and the forecasts for the next few years contained in the special section of this issue present a mosaic which should be studied by everybody in the oil business anywhere.

Pieced together, they show that the world's oil shortage is over. We are right now in a period of transition from global stringency to general adequacy. Excluding Russia, which is a cipher in the international oil trade and may be considered as self-sufficient, the world as a whole will have enough proven reserves, enough producing, refining, and transportation capacity, to meet its anticipated consumptive demands during the next 5 years at least.

This may be something of a surprise after so many years of shortages and predictions of shortages. It has been accomplished both by increased supplies and by a reduction in the rate of increase in demand.

Demand will continue to rise but at a much slower rate than in recent years, and supply will keep abreast or a little ahead. This assumes, of course, reasonably normal international political and economic conditions and the completion of projects now scheduled.

During the past decade world demand for petroleum has virtually doubled—from 4,886,000 bbl. per day in 1938 to 8,822,000 bbl. now. But instead of increasing by an average of 10 per cent each year the rate of growth in demand is expected to drop to about half that.

But the growth in supply and demand is not equal in all parts of the world, and this is a feature that concerns the American producer, refiner, and marketer. In the United States the supply and demand are virtually in balance at the moment but the picture is about to change. The anticipated increase in the domestic production during the next 5 years is less than the expected growth of demand. In the rest of the world the reverse is true.

Before long this country may have not quite enough petroleum for its own needs while other countries have a little more than they need. There will be refinery capacity abroad to produce products formerly obtained from this country, and tank ships available to take crude wherever there is a market.

For the consumer the world picture is comforting. He can be assured that foreign oil will be available to make up for any deficiency in domestic output. If imports are no more than that, the domestic producer need not be greatly concerned.

The outlook does not indicate that a flood of foreign oil is about to engulf the United States; only that some foreign oil will be seeking an outlet here. But with exports declining sharply and foreign crude available at tidewater, the next 5 years may see important changes in the pattern of oil distribution and refining within the United States.

Two Court Actions Seek to Oust State Lessees From Tidelands

by Bertram F. Linz

WASHINGTON.—The tidelands issue broke on two court fronts last week, with the Department of Justice seeking to extend the Government's "paramount rights" to the Gulf of Mexico by Supreme Court action while simultaneously two suits were filed in the District of Columbia federal court to force the Interior Department to issue leases in the California tidelands.

The lower court suits were filed by Alma Goettsch and jointly by Earl G. Sinclair and Lauren D. Cherry, all of Long Beach, who recited that they had filed applications for prospecting permits with the Interior Department in 1939 which were rejected on the ground the department had no authority.

The petitioners asked the court to compel the secretary to list as public domain the areas in which they wish to operate and to grant leases. They charged that the city of Long Beach, Long Beach Development Corp., and Richfield Oil Corp. are operating illegally in the area they want, and asserted the State of California never had ownership or possession rights to the lands.

The Justice Department's petitions to the Supreme Court, filed separately for Texas and Louisiana, asked first for leave to bring the cases directly before the highest tribunal, bypassing the lower courts, and then set forth its case in detail, asking for a decree declaring the rights of the United States, enjoining the states and all persons claiming under them from continuing to trespass on the tidelands, and requiring the states to account for all sums of money derived by them from the tidelands subsequent to June 23, 1947, when the court rendered its decision in the California case.

Petitions Identical

The petitions were identical except for the distance seaward from the low-water mark (27 marine miles in the case of Louisiana and to the edge of the Continental Shelf off Texas), and declared that at all times material, the government has been "the owner in fee simple of, or possessed of paramount rights in, and full dominion and power over, the lands, minerals, and other things underlying the Gulf of Mexico" in the areas claimed.

The states, it was recited, claim some right, title or interest in the lands, minerals, and other things adverse to the United States, in exercise of which they have authorized the leasing of underwater lands for the exploitation of oil and gas, and leases have been entered into under which wells have been drilled which "have been producing quantities of petroleum, gas and other hydrocarbon substances, which the lessees of the state have taken and converted to their own uses and for which the lessees have paid to the state substantial sums of money in bonuses, rents, and royalties reserved under the leases, but neither the state nor its lessees have recognized the rights of the United States nor have they paid to the United States either the value of the petroleum and other things taken from the area, or any royalties thereon."

State Has No Title, Court Told

Neither state, the court was told, has any title to or interest in the tidelands, "but possesses only those governmental powers which it has with respect to other lands of the United States within the lawful territorial jurisdiction of the state."

Unless the rights of the federal Government are specifically established by the court, it was declared, "the state will continue to claim such ownership for itself and to exercise the rights incident to such ownership through its officers, agents, and employes, and will continue to aid, abet and encourage others, as its lessees, to trespass upon and to take and use the minerals and other things of value in the area, in violation of the United States, from which the United States will suffer irreparable injury, and for which it has no adequate remedy except by this action."

The filing of the suits followed on the heels of the Supreme Court's rejection of a plea by the Department of Justice that it limit the scope of the hearings to be held in California next month by D. Lawrence Groner, special master appointed to make recommendations on the boundaries of the areas coming under government control. The department contended that Groner was appointed to define merely the boundaries of three disputed areas and should not be permitted to extend his authority to the setting of boundaries on a number of other areas which the state authorities claimed were in doubt.

Maker, Retailer Divorce Sought by Small Business

WASHINGTON.—The major oil and tire companies will be the target of a drive in Congress next year which has been launched by the National Federation of Small Business on the basis of a vote recently taken to ascertain what measures should be pressed.

The chief objective will be a bill for divorce of retailing from manufacturing where such joint operations promote monopoly. Legislation applying this policy to the tire industry has been pressed in three previous Congresses and will be reintroduced, the federation said, and representatives of oil independents have long campaigned for similar divorcement action in their own field and "of late their demands for such action have intensified, and indications are that they will act more forcefully than ever in the Eighty-first Congress."

A preponderant majority of federation members asked for more intensive Sherman Act enforcement, on the basis of House small business committee hearings which, it was asserted, disclosed "that independent oil and gasoline dealers are being deprived, by their suppliers, of their most elemental rights as independent businessmen."

Better enforcement of the Robinson-Patman Act also will be sought as a result of complaints of independents, chiefly in the oil, tire, and food fields, over pricing discriminations.

Little business will take an opposing part in any effort made in Congress to legalize any form of freight absorption pricing that may promote monopoly or be used collusively on an industry-wide basis to create or maintain price-fixing combinations, it was declared.

Slagter Bid Gets Indian Lands in Michigan Field

A. J. Slagter, Jr., of Mt. Vernon, Ill., was the highest bidder for 60 acres of Indian-owned land in Isabella field, Michigan, December 17, when sealed bids were opened at Green Bay, Wis.

Slagter's bid of $30,300 topped three other offers. Included in the Indian tribal lands which were offered for lease under the jurisdiction of the Department of Interior, was a 20-acre description, N½ NW NE 18-15n-4w, and a 40-acre tract, NE NE 18-15n-4w, located within ½ mile southeast of Merrill Drilling Co. 1 Sheahan Dundee, which was the discovery well in the area.

The bonus was paid for a straight seven-eighths lease with no special drilling commitment.

Gulf States Vow Last-Ditch Fight Against Federal Tidelands Claim

THE suits filed in the Supreme Court last week to assert federal jurisdiction to the offshore oil resources of Texas and Louisiana have aroused a storm of protest in those states and officials there have announced that they will fight to retain state control in the courts and in Congress with everything in their power.

Attorney General Price Daniel of Texas said: "We are prepared to defend Texas' title and will fight this case with the same spirit that caused our predecessors to win these lands by blood and valor at San Jacinto."

Attorney General Boliver Kemp of Louisiana said: "Our state's rights and our state's property will be vigorously defended all the way. We will fight at every step. The best legal talent in the state will be conscripted to help."

Officials of oil companies generally took the view that the issue is not an attack on the oil industry but is a fight between the federal Government and the governments of the individual states. If the federal Government should win these suits and follow the pattern of the California case it presumably would recognize the equity and investments of oil companies operating under state leases in the Gulf of Mexico but might impose more severe restrictions as to future development. However, the oil industry is virtually unanimous in preferring to operate under state leases and regulations.

Congressional Action Required

The general feeling was that no matter how the Supreme Court rules its decisions will not settle the issue and the controversy can be ended only through congressional action. To this end legislators from Texas and other states prepared to introduce legislation as soon as the new Congress convenes renouncing federal claims and affirming state title to all submerged lands.

Rep. Ed Gossett of Texas, who sponsored such legislation in the last Congress, announced that he will reintroduce the measure immediately. Rep. Sam Rayburn of Texas, who is slated to be Speaker of the House, is expected to lead the fight. Sen. Tom Connally will also take an active part.

Gossett expressed the fears of many when he said: "The raid of the federal Government upon the tidelands is a big step toward national socialism and a severe blow to states' rights generally. The next step to be taken by those who fathered the tidelands controversy will doubtless be to take over and nationalize the entire oil industry."

Gov. Beauford H. Jester of Texas said: "If the Attorney General of the United States files this suit against Texas for its submerged lands in the Gulf, he is preempting the authority of the Congress to affirm or break the annexation agreement made with Texas when it entered the Union. If the federal Government can nationalize the land, mineral, and other things along the coasts of the states of this Union, it can nationalize them in the interior."

Texas Situation Different

Texas entered the Union under different conditions from other states since it was an independent republic and came in by treaty which reserved all public lands. At that time Texas claimed its boundary was 3 leagues, about 10.35 miles, offshore, but last year the Texas legislature extended its boundary to the 100-fathom mark, or the edge of the Continental Shelf. The original submerged area totals 2,608,774 acres, and the extended claim embraces 17,706,000 acres, an area equal to one-tenth of the land area of Texas.

Louisiana claims that its boundary extends 27 miles into the Gulf of Mexico. Both states have leased large areas offshore for oil and gas development, though much more remains unleased. Texas has received $7,201,666 in leases in deep-water areas. In Louisiana, where there has been more off-shore development, the state has obtained more than $30,000,000 for leases, bonuses, and royalties on production.

Shell Tests Deepest Pay On Weeks Island Dome

HOUSTON.—Shell Oil Co., Inc., has tested the world's deepest pay sand for 672 bbl. of oil per day in its A-1 J. A. Smith, Weeks Island dome, Iberia Parish, Louisiana. However, the well has been unofficially reported to have been finally completed at 14,243-55 ft. which is shallower than the world's record for oil production. Pure Oil Co. is the present record-holder with pay at 14,309 ft. in its 1 West Poison Spider in Natrona County, Wyoming.

With a total depth of 15,094 ft. reached, Shell set 5-in. pipe to 14,974 ft. in its deep test. Liner was perforated with 32 shots from 14,904-12 ft. for the record test. The well came in flowing 672 bbl. daily of 44.5°-gravity oil through 26/64-in. choke and with flowing pressure of 400 psi. Gas-oil ratio was 16,200 to 1.

On a second test, the well was perforated at the interval 14,243-55 ft. Results were 420 bbl. of 33°-gravity oil daily through 10/64-in. choke with tubing flowing pressure of 2,600 psi. Gas flow was 472 M.c.f. daily. Another pay at 13,407-60 ft. may be tested.

Diamond Bits Put Under Export Control by OIT

WASHINGTON.—The Office of International Trade has put diamond bits for oil or gas-well drilling under export control, and specific license will hereafter be required for all shipments except to Canada.

The Census Bureau will issue a new "Schedule B" classification for export shipments this week, showing new commodity code numbers for a number of items. Its use will become mandatory January 1, after which date customs officials have been instructed to accept no shipper's export declarations which do not carry the new numbers.

An extensive revision of the schedule was necessitated to accommodate more detailed classifications of export commodities. The new arrangement will provide separate classifications for approximately eight classes of pipe which heretofore have been grouped under casing or line pipe.

Unit Agreement Tax Ruling To Become Effective July 1

The effective date of a recent ruling of the Bureau of Internal Revenue, defining the tax status of joint operating agreements, such as unit agreements, has been postponed until July 1, 1949.

The postponement came as a result of considerable complaint from the oil industry as to the short notice given in the ruling. The ruling which defined some unit agreements as subject to corporation taxes originally provided that it would become effective January 1, 1949, giving participants of joint operating agreements until December 31, 1948, to modify their agreements so as to escape the corporation levy.

An individual or organization which may be subject to this rule will now have until July 1, 1949, to amend the agreement under which it is operating, if amendment is necessary to avoid being classified for tax purposes as a corporation. *(For more complete information on the ruling see The Oil and Gas Journal, December 9, page 46.)*

Bureau of Mines Forecasts Demand At 6,548,000 Bbl. Daily in 1949

WASHINGTON.—The Bureau of Mines' forecast last week that total demand for oil products in the United States during 1949 will average 6,548,000 bbl. daily, compared with 6,191,000 bbl. during the year now ending.

The bureau's figures now give the industry three estimates to work on—the economics advisory committee of the Interstate Oil Compact Commission having estimated earlier this month that the 1949 demand would be 6,517,000 bbl. daily compared with 6,167,000 bbl. this year, and the supply and demand committee of the Independent Petroleum Association putting next year's demand at 6,705,000 bbl. daily.

The government estimates differed from those of the two industry groups in other respects, placing domestic production of crude and other oils at 6,000,000 bbl. daily for the coming year, as compared with the compact commission's 5,987,000 bbl. and I.P.A.A.'s 6,270,000 bbl.; and imports at 548,000 bbl. compared with the commission's 545,000 bbl. and I.P.A.A.'s 440,000 bbl.

Estimates Revised Downward

The bureau revised its 1948 estimate to drop total oil demand to about 2 per cent under what it figured last August, explaining that a reduction in anticipated demand occurred during the last half of the year as a result of major declines in estimated residual and distillate fuel-oil deliveries and smaller reductions in the demand for motor fuel, kerosine, and other products. These reductions came about from the fact that early stocking of heating oils by distributors and consumers tended to reduce deliveries in the fall; the reduced refinery operations in California due to strikes in September and October which materially reduced normal consumption or postponed deliveries, and the recent maritime strikes which curtailed normal export movements.

The forecast for 1949, it was explained, is based primarily on an estimate of an increase of 6.4 per cent in domestic demand for all oils, involving an increase of 8 per cent in motor-fuel demand, a decrease of about 1 per cent in demand for residual fuel oil, and gains of 12 per cent in distillate fuel oil, 10 per cent in kerosine, and 6 per cent in other oils.

"While part of the general reduction in anticipated demand in 1948 may have been due to abnormal causes," the bureau said, "it is believed that the available data indicate that future rates of increase will be relatively smaller than in 1947 and the early half of 1948."

No Stock Increase Necessary

Over 3 per cent of the total new supply of all oils this year went into increased stocks of crude and products, it was pointed out, and it is not estimated that further increases in stocks will be necessary in 1949. For this reason, an increase of 2.4 per cent in new supply will provide for an estimated gain of 5.8 per cent in total demand.

In round figures, the bureau looks for a 1949 output of 2,037,000,000 bbl. of crude and 153,000,000 bbl. other oils, compared with present estimates of 2,012,000,000 bbl. of crude and 143,000,000 bbl. other oils this year, and imports of 149,000,000 bbl. of crude and 51,000,000 bbl. refined products against 126,000,000 bbl. of crude and 59,000,000 bbl. refined products, making a total new supply of 2,390,000,000 bbl. compared with 2,340,000,000 bbl.

Demand for Residual Down

Demand will include 975,000,000 bbl. of motor fuel against 910,000,000 this year; 513,000,000 residual against 520,000,000; 406,000,000 distillate against 365,000,000; 130,000,000 kerosine against 119,000,000; and 366,000,000 other products against 352,000,000. Exports will include 35,000,000 bbl. of crude, against 39,500,000, and 96,000,000 products against 97,500,000.

The daily averages, in thousands of barrels, will be shown in the accompanying table.

	1st Q.	2nd Q.	3rd Q.	4th Q.	1949	1948
Total production	5,856	6,000	6,054	6,087	6,000	5,888
Imports	556	539	543	554	548	505
Change in stocks	—332	+242	+271	—185	0	+202
Total demand	6,744	6,297	6,326	6,826	6,548	6,191
Exports	344	396	380	315	359	374
Domestic demand	6,400	5,901	5,946	6,511	6,189	5,817
Runs to stills	5,627	5,750	5,810	5,850	5,760	5,546
Demand domestic crude oil	5,450	5,585	5,636	5,650	5,581	5,456

Stanolind Purchasing Takes Over 4-State Crude Buying

Stanolind Oil Purchasing Co. will assume all of the activities and agreements of Standard Oil Co. (Ind.) for the purchase and sale of crude oil in the states of Oklahoma, Kansas, Colorado, and Wyoming, effective January 1, 1949. General offices of the purchasing company will be in Tulsa.

All personnel of Standard Oil Co. (Ind.) crude purchasing department will be offered the privilege of transferring employment to Stanolind Oil Purchasing in their present capacities with full credit for service with Standard Oil Co. (Ind.).

Stanolind Oil Purchasing, which has been active in the purchase and sale of crude oil for many years with field offices at Dallas, Houston, Midland, Wichita Falls, and Tyler, Tex., will take over the offices of Standard Oil Co. (Ind.) crude-oil purchasing department, at Oklahoma City, Wichita, Kans., and Casper, Wyo.

The purchasing company is under the direction of Ralph O. Dietler, chairman of the board; A. C. Sailstad, president; D. L. Wolfe, vice president; C. G. Irsch, director in charge of accounting and finance; F. J. Ryan, treasurer; L. M. Jones, secretary; and Ralph W. Boyd, comptroller.

Texas Commission Cuts Coke Field Allowable

HOUSTON.—In a follow-up to its December 15 proration order cutting the January allowable for the state 250,985 bbl., the Texas Railroad Commission has further cut the allowable for Coke field sub-Clarksville reservoir, Wood County, to 979 from 1,560 bbl. daily.

In issuing the order, the commission stated that "from additional evidence submitted to it the market demand for heavy crude from Coke field has been substantially reduced." Hiram Brown of Talco Pipeline Co. had stated at the December 15 hearing that such was the case. He recommended cutting the allowable in half.

New York Barge Plant Sold To Odenbach Shipbuilding

A surplus wartime barge-building plant at Greece, N. Y., has been approved for sale by War Assets Administration to its wartime operator, Odenbach Shipbuilding Corp., for $250,000.

The property consists of about 117 acres of land, containing a main building, machine shop, service building, yard office and office building, with a total space of about 200,000 sq. ft. Odenbach operated the plant during the war under a lease from the Defense Plant Corp. for construction of tankers and barges.

this week

INTERNATIONAL— Special section of this issue contains important surveys of world's oil situation, refinery, pipe-line, and tanker projects. . . . Forecasts that supply will soon outdistance demand. . . . ¶Venezuelan crude production cut back sharply because of improved world supply in petroleum and products. . . . ¶Deepening of Suez Canal and construction of a 6-mile bypass will enable larger tankers to make use of short cut. . . . ¶California Standard will receive experimental shipment of Saudi Arabian crude at Richmond refinery in January. . . . ¶Societe Belge des Petroles organized to construct 30,000-bbl. refinery in Antwerp, Belgium. . . . ¶Rep. R. L. Crosser is guest of Mexican Government to discuss development of Mexican oil reserves with U. S. capital and technique. . . .

TIDELANDS— Texas and Louisiana plan strong court battle against Department of Justice suit asserting federal jurisdiction over Gulf of Mexico offshore oil lands. . . . Oil men consider action is not an attack on the industry but they prefer state jurisdiction. . . . Prevailing view is that Congress must decide the issue regardless of Supreme Court ruling on constitutional question. . . .

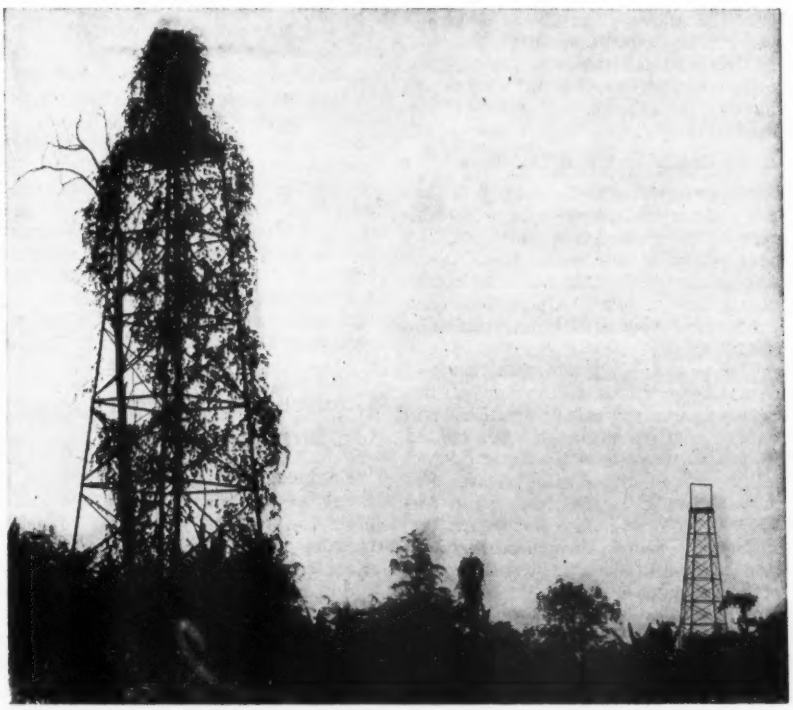
FORECASTS— Bureau of Mines forecasts domestic demand for petroleum products at 6,548,000 bbl. daily during 1949. . . . Compares with average of 6,191,000 bbl. daily this year. . . . Includes high estimates of crude imports. . . . ¶Series of exports on international outlook predict adequate reserves, production, refinery capacity, and tankers to meet world needs during next 5 years. . . . World-wide demand flattening off while available supplies are gaining. . . .

TRENDS— Crude-oil production for week ended December 25 averaged 5,633,775 bbl. daily. . . . Highest since all-time record of week ended November 20. . . . New highs recorded by Oklahoma, Louisiana, and Colorado. . . . ¶Bureau of Mines report showed October demand for all petroleum products declined 128,000 bbl. daily compared to same month in 1947. . . . Domestic demand dropped 32,000 bbl. daily and export demand 96,000 bbl. daily. . . . Residuals, lube oils, and asphalt accounted for largest declines. . . . ¶For 2-week period ended December 18 residual stocks were up 836,000 bbl. compared to a decrease last year for the same period of 3,443,000 bbl. . . . Gasoline stocks were up 2,990,000 bbl. compared to a gain of only 88,000 bbl. in the same time last year. . . . Distillate stocks were down 2,922,000 bbl. as compared to a decline of 6,739,000 bbl. last year. . . . ¶Lowering price levels continue for some petroleum products. . . . Esso cuts heavy fuel prices for second time within past month. . . . Diesel fuel price also down and gasoline wholesale prices raised. . . .

NATURAL GAS— United Natural Gas rates may be discriminatory, will be investigated by FPC. . . . ¶Rehearing on FPC order governing filing of tariffs of natural-gas companies, denied 13 applicants. . . .

REFINING—Refinery expansion amounting to $163,000,000 makes Philadelphia Harbor area second largest refining region in the nation according to Philadelphia C. of C. figures. . . . ¶Carter sells 2,000-bbl. Newcastle, Wyo., plant to Cooperative Refinery Association. . .

PIPE LINES— Utah Oil Refining Co. will operate its own lines after termination of contract with Stanolind Pipe Line Co. . . . ¶FPC survey shows 38 pipe-line projects delayed because pipe is unobtainable, 10 delayed because of other shortages. . . .¶Traffic of 44 large pipe-line companies up 6.18 per cent over corresponding quarter of 1947.



How the oil industry is overcoming the jungle which grew up during the war is illustrated in this picture from Sumatra where Standard Vacuum Petroleum Mij. is clearing the growth from some of its derricks but still has much to do. How the world's oil industry has overcome the effects of the war is shown in the special section of this issue which reveals that supply has caught up with demand and the world as a whole can be assured of adequate supplies for the next several years if projects now scheduled can be completed

International

WORLD-WIDE OIL DEVELOPMENTS

Weak World Market Reflected In Venezuelan Crude Cutback

PRODUCTION of crude oil in Venezuela has been cut back sharply in recent weeks as a result of weakness in world markets, particularly for heavy fuel oil.

This development, which became known last week, was additional proof of the vastly improved supply situation in petroleum and its products. In the United States, this has been reflected in record high inventory levels.

The exact amount by which production has been reduced in Venezuela was not known but was said to be substantial. The reduction is expected to be shown in December production figures which will be available probably early in February.

Venezuelan production has been rising steadily since 1941. This upward trend continued after the war, contrary to expectations, as the operating companies sought to meet the heavy, unanticipated postwar demand.

Creole Is Major Operator

Major operator in Venezuela is Creole Petroleum Corp., which in September accounted for some 48 per cent of the total Venezuelan production of about 1,370,000 bbl. daily. Creole is understood to have cut back production largely in Lake Maracaibo heavy crude.

The action was taken as a result of demand conditions. Heavy fuel oil has been especially weak on the East and Gulf Coast markets of the United States in recent months. Residual fuel oil stocks in the United States are now above 86,000,000 bbl., some 33,000,000 bbl. more than last year.

Creole's Lake Maracaibo production, which in October was reported at more than 484,000 bbl., is moved mostly to the Aruba, N.W.I., refinery of Lago Oil & Transport Co. Runs at Aruba are reported to be off sharply and are now in the neighborhood of 325,000 bbl. daily.

Other recent developments have pointed to the break in the record heavy demand for crude oil. The Shell group, second largest Venezuelan producer, recently notified the Government it would no longer pay a premium for the Government's royalty oil from its concessions, and other large operators are expected to terminate these bonus arrangements as they expire.

Third major Venezuelan operator is Mene Grande Oil Co. C. A. (Gulf), producing about 190,000 bbl. daily. This company has not reduced its output. The position of the Shell companies in Venezuela at this time was not known.

Creole in its last annual report forecast 1948 production about 10 per cent above the 1947 output which averaged 589,442 bbl. daily. At that time, the company pointed out: "As the rate of production reaches such high levels, it becomes increasingly difficult to effect important percentage increases, both on account of the effort required to maintain the present rate, and the difficulties still being encountered in obtaining materials vital to our needs." Most important single market for Creole crude and its products is the United States, taking 31.9 per cent in 1947. Canada accounted for 12.9 per cent, and more than 25 per cent went to Europe and North Africa.

Construction to Start On Brazilian Refinery

Engineering work and procurement of materials is nearly complete for the 2,500-bbl. daily-capacity refinery which M. W. Kellogg Co. has a contract to build at Bahia, Brazil.

Some material has been shipped, and actual construction is expected to get under way early in 1949. The plant will be a combination unit equipped with thermal cracking facilities, and will be operated in connection with a pipe line being built by Brazilian interests to the nearby Brazilian producing fields.

Gen. Joao Carlos Barreto, president of the Conselho Nacional de Petroleo, is reported to have said in Rio de Janeiro recently that the Bahia refinery will be operated by a mixed government-private company, Refinaria Nacional de Petroleo, S.A.

The Brazilian Government has plans for construction of three other refineries, in the federal district of Rio de Janeiro, at Belem, and at Sao Paulo, all to use imported crude oil. Reports are that the government hopes to obtain some of the equipment for the plants from France and Czechoslovakia, using accumulated currency balances.

Suez Bypass, Deepening To Facilitate Tanker Use

SUEZ CANAL CO. announced last week in London plans for major improvements on the waterway which is heavily used by tankers in the Middle East oil trade.

The company said it would construct a 6-mile bypass about 30 miles south of Port Said in order to speed up movement of vessels through the narrow part of the canal. In addition, the canal will be deepened by 20 in. over its entire length.

Deepening of the canal will enable it to accommodate the larger size tankers which are the trend in current tanker construction. Steering of large vessels also will be improved as a result. The deepening job will take 4 or 5 years to complete.

Construction of the bypass requiring 2 or 3 years is subject to a concession for the additional land required. It will assure "complete safety" for the increasing number of vessels using the 101-mile waterway, the Suez company said.

At present, the major part of Middle East production is moved through the canal, much of it going to Europe. Completion of Trans-Arabian Pipe Line Co. project and other Mediterranean pipe lines planned, is expected to cut heavily into tanker movement through the canal several years hence.

Experimental Shipment of Middle East Oil on Way to West Coast

International
WORLD-WIDE OIL DEVELOPMENTS

THE first shipment of Middle East crude oil to reach the West Coast of the United States is scheduled to be unloaded in mid-January at Standard Oil Co. of California's Richmond refinery near San Francisco.

The crude oil will be used in a trial run at the California refinery, and T. S. Petersen, California Standard president, in a company announcement, emphasized that the shipment was purely of an experimental nature and did not in any way indicate plans in the immediate future to make regular hauls to the West Coast.

The tanker, S. S. California, loaded approximately 130,000 bbl. December 10 at Ras Tanura in Saudi Arabia where Arabian American Oil Co., 30 per cent owned by California Standard, is now producing about 480,000 bbl. daily.

Imports of Middle East crude oil into the United States were averaging nearly 100,000 bbl. daily in October, the latest month for which Department of Commerce import totals are available. Practically all this is being taken by East Coast refineries, with minor amounts being received on the Gulf Coast.

Crude Imported on Trial Basis

In the past, as Middle East crude imports were commenced by various companies, experimental cargoes often preceded regular shipments and were used to determine if the refinery equipment was suitable for processing the particular stock. Gulf Oil Corp. brought in the first Middle East oil, an experimental shipment from Kuwait, in October 1946 at Philadelphia.

Customs reports show that in October Saudi Arabia crude made up about 28,000 bbl. daily of the 99,000-bbl. daily average of Middle East crude being received in the United States. The remainder was from Iran, about 36,000 bbl. daily, and Kuwait, about 35,000 bbl. daily.

Standard Oil Co. (N. J.), The Texas Co., and Socony-Vacuum Oil Co., Inc., the other three companies sharing in the ownership of Arabian American, are bringing in varying amounts of crude from the Middle East. Socony-Vacuum and Jersey Standard also have a purchase agreement with Anglo-Iranian Oil Co., Ltd., under which they are buying Iran crude.

California Standard's announcement of the experimental cargo due at San Francisco said the tanker was proceeding via the Pacific route. Transportation maps show this route as a total of some 11,000 miles, but it avoids the toll charge at the Suez Canal, and another at Panama if the crude were taken across the Atlantic to the West Coast.

Imports of crude oil into the United States in October were at a rate of 371,000 bbl. daily. About 251,000 bbl. daily was from Venezuela, and the remainder from the Middle East, Collombia, and Mexico. Aside from small samples, records show no crude oil has been imported into California from foreign sources in the last 10 years.

New Refineries Planned For Italy and Sicily

Plans for the construction of two new refineries, one in Italy and one in Sicily, both to operate on Middle East crude oil, are reported by Italian sources.

California Texas Oil Co., Ltd., is reported cooperating with Petrolea Co., controlled by Fiat interests, in the building of a plant at Trecate. Planned capacity throughput of the refinery is between 10,000 and 20,000 bbl. daily.

The plant is to be supplied through a 20-cm. pipe line (about 8 in.) extending from Vado Ligure, a distance of about 90 miles. Reports are that the refinery will include crude storage equal to about a month's throughput, and that Petrolea's storage at Vado Ligure will be expanded to about 425,000 bbl.

The second project reported will be at Punta Cugno, a naval base near Augusta, Sicily. American equipment is to be used for the refinery, and some existing underground storage will be taken over. Capacity is given at about 6,500 bbl. daily. Interests financing this plant were not reported.

30,000-Bbl. Refinery to Be Built in Antwerp, Belgium

Another new refinery for Western Europe was projected last week with the announcement in London of the formation of a joint company by Anglo-Iranian Oil Co., Ltd., and Cie. Financiere Belge des Petroles.

The new company, Societe Belge des Petroles, was organized for the construction of a new 30,000-bbl. daily refinery in Antwerp, Belgium. Anglo-Iranian and Cie. Financiere Belge des Petroles, generally known as Petrofina, hold equal interest in Societe Belge des Petroles.

Construction of the new refinery is scheduled to begin in 1949 with completion due some time during 1951 or 1952.

Petrofina is a major European oil enterprise. It holds controlling interests in refining, marketing, and tanker companies operating in Belgium, Holland, France and other countries in Europe and Africa. Anglo-Iranian is now producing about 560,000 bbl. daily of crude oil from its concessions in Iran. Organization of the new Belgian refinery company is thus a natural linking of producing and refining interests.

Crosser Is in Mexico to Discuss Oil Development

WASHINGTON. — Representative Robert L. Crosser of Ohio, scheduled to be the next chairman of the House interstate commerce committee, is in Mexico as the guest of the Mexican Government, reportedly to confer with President Aleman, Antonio J. Bermudez, director general of Pemex, and other officials regarding the possibilities of using United States capital and technique to develop the country's oil resources.

Crosser went to Mexico by air at the invitation of the Mexican Government which apparently wishes to pass on to the new chairman the information and arguments submitted to present Chairman Charles A. Wolverton of New Jersey and other members of the committee who visited the country last summer.

His trip revived speculation that the Mexican Government, which has tried to negotiate agreements with American oil companies to undertake exploration and development contracts, is exploring the possibilities of securing a loan from Washington to undertake the work itself.

Washington sources said such a loan would be possible, but might involve an agreement that the work be supervised by American oil specialists.

The full House committee is to get together, probably on the eve of the new Congress, to discuss the Mexican situation and presumably thereafter will make known the results of the Wolverton and Crosser trips. The committee's technical staff has prepared a comprehensive report on Mexican oil, and that and the committee's recommendations will be embodied in a final report signalizing the conclusion of the Eightieth Congress.

Basing-Point Pricing Essential To Oil Industry, Rodman Insists

by Roland V. Rodman

The Supreme Court decision upholding the Federal Trade Commission order against the Cement Institute has been interpreted as outlawing all basing-point pricing systems and as foreshadowing an attack on the Group 3 and similar bases under which part of the freight is absorbed in marketing petroleum products. On this page is the view of the president of Anderson-Prichard Oil Corp., Oklahoma City, as given recently before a Senate committee.

AS refineries were built at different Kansas and Oklahoma points, the railroads, generally, applied the same rates on the transportation of petroleum products as were in effect from other points in the same general area.

In 1915 competition among the Kansas and Oklahoma refineries was very keen. They were also competing with the products from refineries located near Kansas City, St. Louis, and Chicago. Most of the crude oil moving into the last-named points was moved by pipe lines.

The railroads recognized that, if they were to continue to move the products of the refineries in Kansas and Oklahoma, rate adjustments were necessary. The Interstate Commerce Commission, therefore, in the Mid-Continent oil rates case, decided August 13, 1915, established reasonable rates for the transportation of refined oils, grouped the Oklahoma refineries and the Kansas refineries in the same group, and established equal rates for the movement of petroleum products from various points of origin to Midwest destinations.

Later the ICC divided this general area into three groups for rate-making purposes, Group 1 points having a Kansas City origin, Group 2 a Southeast Kansas origin, and Group 3 an Oklahoma origin. Other groups were made, known as the Burkburnett or North Texas group, the Ranger group lying to the south and west of the North Texas group, the Shreveport-El Dorado group, the New Orleans-Baton Rouge group, the South Texas group, etc. All shipments of products originating within each group carried the same freight rate to the same destination as shipments from other points within the same group.

Use Based on Regulations

Thus it will be seen that the use of basing points by the oil industry comes not from the action of the industry, but by virtue of the acts of the Interstate Commerce Commission in the regulation of railroad rate structures.

Refineries located near the point of crude production have a low laid-in transportation cost on the crude oil refined, in many cases as low as 5 or 6 cents per barrel. Refineries located at points of high consumption such as Chicago have a high laid-in transportation cost on crude oil from West Texas fields of about 40 cents per barrel. We are now led to believe that it is proper for a refiner located at a point of high consumption in the Midwest to absorb a high laid-in cost on the raw commodity, but that a refiner located beyond so-called Group 3 cannot absorb freight on the refined product reaching the same market on a competitive basis.

If refiners located beyond Group 3 are to share in the Midwest gasoline market under today's conditions, it is necessary that certain freight be absorbed by them in order to compete with refiners located in Group 3.

If the petroleum industry is required to adopt an f.o.b., mill-net basis for its sales, every refiner will be given an island of monopoly in the vicinity of his plant extending in each direction half way to the point of production of the nearest competition. This would mean that plants in sparsely settled areas would not have sufficient business upon which to operate and that plants in high consuming areas would not have sufficient products to meet market demand.

Industry Confused

The problems that our company faces are not different from those of other companies in greater or less degree. The industry is operating in a state of confusion. We are studying plant improvements and additions that may cost from $3,000,000 to $5,000,000. We are hesitant to go forward lest our present and future investment may be destroyed by the courts or commissions reading into law things that Congress repeatedly has refused to place there.

The locations of the principal refineries in the United States have been chosen by the experience of the industry to best serve the public. Economic forces have dictated the choice of location. The petroleum industry is a highly competitive industry. Competition within the industry has constantly given the public a better product for a lower price. Do what you will to prevent price fixing and collusion, but let neither the courts nor government agencies, by fiat or decree, alter principles of economics established by experience.

At present the courts are not unanimous in their interpretation of freight absorption. Members, counsel and experts of governmental agencies are not in accord as to basing-point systems and frieght absorption. It is unfortunate that members of our industry, perhaps, have been mistaken in their basic concepts of law and business for at least two generations. We need a law that the ordinary business man can understand. We need a law susceptible of only one interpretation by the courts, governmental agencies, their counsel, and their experts.

Legislation Needed

We must by legislation declare (a) that the use of basing-point systems per se shall not be evidence of price-fixing conspiracy under the Sherman Act; (b) that freight absorption per se shall not constitute an unfair method of competition under the Trade Commission Act; and (c) that freight absorption per se shall not constitute price discrimination under the Clayton Act as amended by the Robinson-Patman Act.

Any lesser remedy would (a) leave business in a state of confusion, and the courts and government agencies divided in opinion as to what is or is not legal; (b) destroy the capital investment of small companies owning but one plant located where freight absorption is necessary to reach markets also served by large companies who may have many points of production; (c) retard plant expansion and development at points near raw materials in sparsely settled areas and cut the flow of venture capital in such expansion; (d) render unemployed persons now employed in such plants and destroy their investments in homes and business adjacent thereto; (e) create local monopolies for the benefit of plants located in high-consuming areas or high-producing and consuming areas; (f) deny to the public the benefit of competion between areas made possible by differentials in labor, material, and transportation costs as between areas; (g) cause the shifting of population from sparsely settled areas to high-consuming areas, by reason of relocation of plants, inimical to the financial, moral, and social welfare of the workers and contrary to the best interest of national defense.

Gill Sees No Threat in FTC Move Against Collusive Price Systems

by John D. Gill

A view contrary to that on the opposite page is given here by the chief economist of Atlantic Refining Co., Philadelphia. He takes the position that competition in pricing is more important than retention of any particular method and that the oil industry has nothing to fear so long as it avoids collusive practices. Group 3 pricing, he says, is not as suspect from the standpoint of collusion as some other practices which form the basis for uniform prices.

A LARGE part of the business community has taken a very non-free-enterprise attitude regarding the Federal Trade Commission and the Supreme Court basing-point decision in the cement case. Many businessmen, some of my acquaintance, agree that free enterprise is under attack the world over. They will affirm their conviction that free enterprise is the most socially useful economic system known. They will defend it by loud statements from the houstops, and then turn around and themselves attack its foundations just because the maintenance of free enterprise interferes with their business. It is this talk-one-way-and-act-another that is difficult to understand in men who must be logical in other matters in order to be successful.

Free enterprise, or competitive economic activity, requires that competition be kept alive and keen. The Sherman Antitrust Act and the Clayton Act were invoked to that end.

FTC Is Policeman of Business

The Federal Trade Commission was created to help administer those basic laws to keep free enterprise free. The commission is the policeman of business. It should be supported in every act to keep business free until it is proved that its acts are injurious to free enterprise and tend to create monopoly. The present attitude of a part of business seems to be to want to "kill the cop."

Specifically, as I understand it, the Federal Trade Commission has no pet theory on pricing. It is, under the law, violently opposed to monopolistic practices. The basing-point price system, as used in the cement industry, was diametrically opposed to the maintenance of the competitive system. Maybe also in the steel industry. Senator Capehart, himself, said he could not support the use of the basing-point price system in either of those industries.

In the oil industry all we have to do is to watch that our pricing methods are independent, clean and free of even the appearance of collusion. We can employ our own basing-point system and no harm, even in the eyes of the FTC. As a matter of fact, or at least of my belief, the old Group 3 pricing practice is not nearly so important as some other basis for uniform prices which have little to do directly with the basing-point concept.

As businessmen we have a great opportunity to help strengthen free enterprise or to help kill it. I am for trying to save it, and think that one way to help is to support the Federal Trade Commission until I am convinced that they are in the wrong.

Finally, I think that it ill suits free enterprisers to suggest more economic legislation by the Congress. We have enough legislation on the books already to maintain free enterprise fairly free, and need no detailed legislative directions.

A very good explanation of attitude of the Federal Trade Commission toward basing-point pricing was made recently by Corwin Edwards, chief economist of the commission, in which he said:

"An attack upon collusive price fixing through the use of basing-point systems does not necessarily constitute an attack upon the basing-point method of pricing. In any particular case of collusion, the question how far a basing-point system may have been used to contribute to the collusive result is one of fact.

"The commission emphasizes the basing-point system if it is so complicated, so rigid, and so contrary to competitive common sense in its results, that its continued existence gives persuasive evidence of the existence of the collusion and if it is so central that its abandonment would be likely to destroy the collusion. However, I must point out that in the cement case the proof of collusion did not rest on the basing-point system alone but also upon discipline of price cutters, admission by members of the industry, and other types of evidence. Similarly, in the pending steel case the charge of collusion does not rest upon the basing-point system alone.

Injury to Competition Is Problem

"Just as collusion is the key to the problem under the Federal Trade Commission Act, injury to competition is the key to the problem under the Robinson-Patman Act. This statute condemns price differences of any kind whenever unjustified by cost difference if the effect is to injure competition either among the sellers or among the customers of the discriminating seller. If these differences create no injuries to competition, there can be no violation of the Robinson-Patman Act.

"Being unable to justify themselves by cost differences, those who use basing-point systems sometimes argue that their discriminations have been made in good faith to meet the equally low prices charged by competitors. The law provides an exemption for this kind of defensive discrimination.

"In the light of this analysis I offer a few conclusions as to the present status of the basing-point problem.

Basing Point Not Attacked

"1. Basing-point systems, as such, are under no special attack. In proceeding against collusive price fixing and injurious price discriminations, the commission attacks basing-point systems where they appear to be central in such illegal arrangements.

"2. Conclusions drawn by some writers about the alleged illegality of delivered-price systems are much broader than can be justified by the official acts of the commission and the courts. It has been asserted that all delivered-price systems are unlawful, that uniform prices throughout the country are unlawful, that the only lawful method of pricing is f.o.b. mill, and that it is unlawful for a seller to absorb freight in competing with another seller. In fact, however, no commission order has yet required f.o.b. - mill pricing nor forbidden freight absorption, except in a context of collusion or injury to competition, nor challenged the legality of uniform delivered prices.

"3. Compliance with the law is much easier than it is made to appear in some current comments. People who participate in price-fixing conspiracies know that they are doing so.

"The injuries to competition which create illegality under the Robinson-Patman Act may arise from a particular price differential but do not necessarily do so. Consequently, at first glance, it seems difficult for a seller to know whether he is in violation of this part of the law. In practice, however, such injuries lead to complaints which are addressed to the seller long before they reach the Government. The practical way in which a business man can be confident of the legality of his own pricing methods is to be sure that he is not a party to a price-fixing conspiracy and that his customers are not challenging price differences for which he can supply no cost justification."

WASHINGTON WATCHING

BY BERTRAM F. LINZ

Tidelands Tussle

WASHINGTON.—The filing of suits to give the federal Government "paramount rights" over the oil-bearing tidelands in the Gulf of Mexico has stiffened the determination of important groups in Congress to press legislation restoring title to the states and may bring a definite split in Democratic ranks.

The legislation, sought unsuccessfully twice in the past 2 years, will be introduced immediately upon the convening of the new Congress January 3. It may prove difficult to get quick consideration by the House judiciary committee, of which Rep. Emanuel Celler of New York is slated to be chairman, but the Senate judiciary committee will come under Sen. Pat McCarren of Nevada, a strong supporter of state ownership who joined Sen. Ed Moore of Oklahoma last session in his fight against Sen. Forrest C. Donnell of Missouri and the St. Louis Post-Dispatch, which made a crusade against the legislation.

Back of the present situation is some years of shadow-boxing which turned into a real fight in 1945, when former Attorney General Biddle caused a suit to be filed against one of the oil companies claiming ownership for the federal Government of the submerged California lands on which the company was operating. That suit was later dropped and the case brought in the Supreme Court by Attorney General Tom C. Clark which resulted in the decision in June 1947, that the Government had paramount rights to the oil lands.

The whole thing started back in 1936, when former Interior Secretary Harold L. Ickes, who had previously supported California's ownership of her tidelands, changed his mind. Bills were introduced in Congress calling on the Attorney General to assert the Government's claim, and lengthy committee hearings were held, at which Navy Department representatives revealed they saw in the California submerged lands opportunities for the creation of naval reserves which could be locked up pending need for oil in an emergency, but no legislation was enacted.

For some years thereafter the issue arose sporadically, and hundreds of applications for prospecting permits in the tidelands were filed with the Interior Department by persons seeking to wrest important properties from lessees of the state.

Today, the United States is holder of "paramount rights" to the California tidelands, but the Government cannot issue leases and apparently will not be able to take over actual administration of the properties until Congress gives it authority. As recently as September 1947 the Interior Department rejected more than 700 applications from California and Louisiana because the provisions of the Mineral Leasing Act of 1920 had been held inapplicable to the underwater lands.

A bill providing for Interior Department administration of the tidelands was introduced in the last Congress but was not acted upon.

Meanwhile, the filing of the California suit brought efforts to deal with the situation by legislation. A measure relinquishing any federal claim to the tidelands was passed by Congress in 1946, but was vetoed by President Truman on the ground that no action should be taken while the matter was before the court. A similar measure was passed by the House last session, but Senate action was prevented by the delaying tactics adopted by Senator Donnell.

The new fight which is to be launched in Congress reportedly will be headed in the lower chamber by Speaker Sam Rayburn of Texas. But President Truman has indicated repeatedly that he will not give up the tidelands, and is expected to restate his stand emphatically in his message to Congress next week.

Rosy Outlook

NATIONAL production, income, and profits hit all-time high levels in 1948, and government economists see no cause for uneasiness over 1949 in the recent softening of demand for such consumer items as clothing, electrical appliances, and automobiles.

While the oil industry was setting records in petroleum and refining, and the public was absorbing its products as fast as they were made, other industries likewise were making new marks, with the result that corporation profits after taxes this year may be as much as $3,000,000,000 above the 1947 record of $18,100,000,000.

A Commerce Department review of the situation, however, pointed out that while the profit level is far above that of 1939, the same is true of the other items that go into national income, including salaries and wages.

Further, the department said, if profit figures are adjusted to allow for the current high cost of replacing inventories as they are used up, profits shrink materially and, in effect, are less than they were in the war years.

The value of the goods produced and services rendered this year is seen as likely to hit the $255,000,000,000 mark, a very considerable advance over 1947 but since a good part of the increase was the result of higher prices no measurement of physical volume of output will be possible until the final figures for the year are in.

This week will bring the annual rash of forecasts for 1949 from the various government agencies. All will be reassuring and optimistic in tone, and the general theme will be that there is no reason why the United States, having set new records of prosperity, cannot continue to do so in the future. In fact, some of these reports may say, unless industry and business continue to expand we will not be able to maintain full employment and comfortable living.

Dirty Work Abroad

UNSCRUPULOUS exporters have been able to ship millions of dollars worth of scarce materials out of the country despite export controls as a result of inefficiency and, in at least one instance, collusion in the Office of International Trade.

A lengthy investigation by a Senate committee disclosed that licenses were forged, good licenses were bought and sold on the open market, shipments were made by fraud, licenses were used repeatedly so that several times the allocated volume could be exported, and export commodities were mislabeled.

The committee's inquiry developed no suggestions of any abuses in the export of oil or tubular goods, and there were no indications of any effort to violate the law so far as petroleum exports were concerned.

There is no escaping the conclusion, however, that the OIT operated in a slip-shod manner which wouldn't be tolerated for a moment in any industrial organization.

Applications to export 2,000,000 lb. of lard were cut down by OIT to 199,000 lb., but licenses went out for the original amount and nearly all of it was exported. A license for shipment of 6,000,000 lb. of flour was issued although the entire quota for the quarter was only about 480,000 lb.; worse, the shipment was approved for Liberia—which never could use that much—to move via Lebanon, adding 6,000 miles of transportation. The

flour, of course, was sold in Lebanon.

A large volume of 3-in. nails, badly needed in building construction, moved out as "shoe nails," which were not under control. An OIT official who planned later to go into business with an exporter granted him licenses for excessive amounts of material, later crossing out some of the items when an inquiry was started. A typical double-cross occurred when the exporter refused to return the license, and when it was finally picked up it was discovered the exporter himself had added 68 tons of nails.

The OIT has tightened up on its procedures as a result of these disclosures, but Congress probably will make another survey in the spring to determine whether the export controls are being administered efficiently.

FPC Views With Pride

THE Federal Power Commission went over its books recently and added up some figures which show the tremendous strides made by the natural-gas industry in the past 7 years.

Between February 7, 1942, when the present certificate provisions of the Natural Gas Act became effective, and August 31 of this year, the commission found that 83 natural-gas companies had been authorized to construct 377 projects involving an aggregate expenditure of some $1,159,000,000.

By last August 31, the companies had completed 288 of these projects and had 89 still under construction. The significant fact, however, was that the 288 completed projects involved a cost of only $289,457,000, while the 89 still building will cost an estimated $869,183,000, or nearly 10 times as much per project.

That the size of pipe-line projects is still increasing is evidenced by the fact that while the 89 uncompleted projects call for a total of 2,184,585 tons of steel line pipe, 55 other applications pending at the time of the survey will require approximately 2,500,000 tons and in view of the difficulty of securing pipe it may be several years before they can be completed. Only 821,447 tons of the pipe required for the 89 projects had been received on August 31, and specific delivery dates for the remainder ranged as far in the future as 1953.

Jail for Monopolists

VIOLATORS of the antitrust laws may find themselves facing prison sentences instead of fines next year, if the Department of Justice goes through with plans now under consideration to tighten up on enforcement.

Instead of accepting pleas of nolo contendere from corporation officials, the department may insist that they go to trial on criminal indictments and that, if convicted, they be sent to prison.

Under the procedure followed by the Government in the past, antitrust suits wind up with fines, usually in amounts which mean little to large corporations. Department officials for some time have argued that these fines are nothing more than "licenses" for past transgressions, and that the penalties are not severe enough to deter others from engaging in monopolistic practices.

Bankers occasionally go to jail, but corporation officials rarely, it is pointed out. In really big antitrust cases, the defendants usually try to make a deal with the Department of Justice and generally succeed in getting a consent decree disposing of the civil suit. The corresponding move to dispose of a criminal case is for defendants to throw themselves upon the mercy of the court by a plea of nolo contendere which, without admitting guilt, subjects them to conviction.

A lenient policy has been followed by the department in the past because it didn't have much money for antitrust prosecution and wanted to make what it did have go as far as possible. Now the department is well heeled, the administration is committed to one of the greatest trust-busting campaigns of all time, and Congress is taking a great interest in the plight of the little business man. A stiffer policy, therefore, is in the cards.

Louisiana Distributors Expect No L.P.G. Shortage

HOUSTON.—No shortage of liquefied petroleum gases is expected in Louisiana this winter, a legislative committee investigating the situation was advised this week.

This follows, by several weeks, a similar pronouncement in Texas. Texas governor Beuford Jester's emergency fuel commission was advised that only a problem of storage existed in Texas.

The Louisiana committee, headed by Sen. Brooks Oliver, heard testimany in Baton Rouge last week from state officials and two retail distributors. K. E. Jones, director of the liquefied petroleum gas commission, a state agency, gave this estimate of the supply: "The situation is pretty good. The outlook is excellent for this winter, and even better for the following year. By 1950 it is estimated that the volume of production of butane gas will be six times the present figure. The Bureau of Mines has also looked into the matter and paints a good picture."

Hal S. Phillips, part owner of General Gas Corp., largest retail butane distributor in the state, told the committee, "I don't think we will have a recurrence of what happened last winter."

Members of the legislative committee are Sens. Oliver, Drayton Boucher, Puckett Willis and Rep. Charles Anzalone. Harvey Broyles, newly elected member of the Louisiana Public Service Commission, also sat in on the hearing.

The committee will meet late in January or early in February to hear from producers and brokers of liquefied petroleum gases in the state.

Oil Tax Revenues May Show Big Gain Over Last Year

WASHINGTON.—Federal revenues from the three oil taxes will run between $585,000,000 and $600,000,000 this year, exceeding those of 1947 by anywhere up to $50,000,000, it is indicated by the experience of the first 11 months.

The monthly Internal Revenue Bureau report disclosed this week that receipts for the first 11 months totaled $536,862,000, compared with $492,636,000 in the same period last year.

The November collections included $42,516,033 from gasoline against $36,994,502 in the same month last year, $6,361,249 from lubricating oils against $5,068,915, and $1,339,218 from pipeline transportation against $1,023,186.

For the 11 months ended with November, bureau records show, gasoline tax collections reached $444,494,825 against $406,309,213 last year, lubricating oil paid $75,040,294 against $70,096,755, and pipe-line transportation produced $17,326,932 against $16,229,962.

Legislative Committee To Hear Louisiana Operators

HOUSTON.—Oil operators will be given a hearing January 14 by a nine-man committee of the Louisiana legislature which is investigating the state's conservation act.

Testimony will be taken in a meeting at the Heidleberg Hotel in Baton Rouge. The committee has several recommendations in mind. These include: limiting oil-well spacing to one well per 40 acres; limiting gas-well spacing to one well per 160 acres; conservation commission to hold hearings in the parish involved; commissioner must personally read all evidence; and creation of a three-man commission.

Members of the legislature's committee are: Reps. John J. McKeithen (chairman); Morris Lottinger; A. D. Booth; Marion Vallee; R. J. Bertramb; and Senators Charles A. Tooke, Jr.; C. E. Barham; B. C. Corthers; and Oscar Guidry.

Oil Industry Affected by Many Matters Scheduled for Congress

by Bertram F. Linz

WASHINGTON.—The Eighty-first Congress will convene next week, facing a lengthy legislative program which will deeply affect the economy of the nation, for better or worse.

During the week, Congress will receive three messages from the President—his State of the Union message, to be delivered personally; the budget; and the annual economic report. Among them they will spell out the administration's program and reveal the Government's expected financial situation over the next 18 months, as foreseen by the Treasury department.

Because there will be no change in administration, Congress will be able to get right down to work, and it will have to do so and work fast if it is to enact all the measures which President Truman will ask before it adjourns next summer.

Most of these measures will be highly important, directly or indirectly, to business and industry, and several of them, specifically, will directly involve oil and the oil industry.

Although it received less than 50 per cent of the popular vote, the administration has spoken of a "mandate from the people" for prosecution in a more friendly Congress of the legislative program rejected last session, supplemented by measures which the President, during the presidential campaign, promised the voters he would press.

Heading the program, it is expected, will be repeal of the Taft-Hartley Act and restoration of its predecessor Wagner Labor Relations Act, but undoubtedly with some amendments to the latter to curb improper union activities and give the Government authority to deal with strikes affecting the public welfare.

To Seek Minimum Wage Increase

Also in the field of labor legislation, upward revision of the present 40-cent hourly minimum wage to 75 cents or $1 will be sought, possibly also some legislation to clarify the overtime-on-overtime problem raised by a Supreme Court decision, and a broadening of the coverage of the Social Security Act to take in certain groups of "independent contractors" such as service station operators whom Congress legislated out last session.

Two other measures will have an important influence on both business and taxes—the appropriations for the European Recovery Program and for national defense. The former may run about $4,500,000,000, a half-billion or so under the present 12-month figure, for the fiscal year beginning next July 1, but a supplemental appropriation of about $1,250,000,000 will be required to carry the Economic Cooperation Administration through the fourth and final quarter of the current fiscal year.

The military appropriation is the big question mark. The original Army, Navy, and Air Force proposals called for $23,000,000,000; President Truman this fall set a ceiling of $15,000,000,000, and the Defense Department is expected to press for at least $17,500,000,000 and as much more as it thinks it can get.

ERP and military appropriations will have heavy impact on industry, for the former will cover the supply of oil and petroleum equipment to the Marshall-plan nations and the latter will determine how much automotive equipment, airplanes, and ships will be operated by the armed forces and the consequent demand for petroleum products and steel.

Legislation to Determine Tax

At the same time these measures, plus housing, aid to education, socialized medicine, and such other spending programs as the administration may develop, will determine how much will be needed in the way of additional taxes, for there is little likelihood that any expenditure of the magnitude involved in the programs to which the administration is committed can be financed out of the revenues now anticipated.

Accordingly, the President is expected to ask again for an excess profits tax on corporations and may also suggest, although possibly for action later, that individual taxes on incomes in the higher brackets be increased.

The President also will ask for the standby authority to impose allocations on scarce materials and price controls which Congress refused to grant last session, probably linking the former to extension of Public Law 395, providing for the making of voluntary allocation agreements such as have been entered into by the oil industry, and the steel-industry pacts which cover oil-industry steel needs. Extension of the export controls, which limit the volume of oil, casing, and line pipe and certain other commodities shipped from the United States, also is expected to be brought up for consideration.

First place on the list of measures dealing specifically with oil is held by the tidelands issue, the subject last session of a bitter fight in the Senate judiciary committee which prevented action on a House-approved bill returning the California submerged lands to the state. States-rights supporters will make another attempt to pass the measure, and believe they have a good chance although it is questionable whether such a bill could hurdle a presidential veto.

The synthetic liquid fuels program is expected to be pressed again, with the Interior Department asking possibly for as much as $800,000,000 to get construction of commercial-sized plants under way.

Other Questions Require Action

The new Congress also must deal with the disposition of the government synthetic rubber plants, on which the President must submit a report by April 1, next. The Reciprocal Trade Agreements Act, extended last session only until June 30, next, will come up too, and the President will recommend at least a 3-year extension with elimination of some of the procedural amendments added on by Congress.

While they may not be made the subject of recommendations by the President, it is expected that measures will be introduced to clarify the situation created by court decisions on basing-point prices, and to strengthen the antitrust statutes by prohibiting corporations from buying up the assets of competing companies in order to effect mergers which may not be accomplished through the acquisition of stock.

Although administration leaders have indicated that they look with disfavor upon the many investigations conducted by congressional committees last year, an all-out investigation of lobbying is in prospect and there will be new surveys made of the petroleum situation.

As Congress convenes under Democratic control, a number of reports of committees of the last Congress will be submitted, winding up their work. These reports will include the findings and recommendations of the House interstate commerce committee's investigation of the oil situation and its survey of the Mexican and Venezuelan industries, and summation of the work of the small business committees, which also went extensively into matters regarding the oil industry.

Another Year of Steel Shortage, Economists Say

WASHINGTON. — Department of Commerce economists predict that the current steel shortage will continue for at least another year, and their findings are not disputed by the steel industry which, however, believes that steadily improving European production will ease the pressure for exports from the United States.

Demand in 1949 may exceed supply by 5,000,000 tons or more, despite the hope of the steel industry to increase output from the 88,000,000 tons expected for this year to something above 90,000,000 tons, provided the necessary raw materials are available and there are no interruptions of production.

The department's study will provide a basis for development of administration proposals on allocation controls which are expected to be submitted to the new Congress. Reportedly these recommendations will call for continuance of Public Law 395 backed up by mandatory powers in case industry fails to cooperate, which would insure the continuance of the voluntary agreements now channeling steel into the oil industry.

With the prospects that the steel industry will not undertake any great expansion of production facilities, there is talk in some government agencies of the need for the construction of additional plants by the Government to provide for an eventual output possibly as high as 120,000,000 tons a year, although admittedly such construction in itself would require the diversion of large amounts of steel and, for a year or more, further intensify the steel shortage.

It is also admitted that government construction of plants would provide no relief from the current shortage, since it would take up to 2 years to erect and get them in production.

T.C.U. Given Dr. Scott's Library on Texas Geology

Texas Christian University, Fort Worth, will receive the library of the late Dr. Gayle Scott, eminent Texas geologist, well known in both the oil industry and in scientific circles throughout the world.

One of the most complete libraries on Texas geology in existence, and therefore of unique importance to oil industry geologists, the complete collection will be available to outside scientists and industrial personnel as well as to T.C.U. students and faculty.

Dr. Scott was a world authority on fossil ammonities commonly used in correlation of the earth's strata and had collected during his lifetime, perhaps the world's most complete library on that molluscan group.

Among the most valuable portions of the library is a collection of reprints of geological articles from journals throughout the western world; Texas state geological survey publications, U. S. Government documents, geological magazines, 500 books, many of them rare volumes; Dr. Scott's own writings; documents and photostats resulting from Scott's work in Europe, most of them the only copies in the United States; and notes on his study of the geology of France, correlating it with that of Texas.

First Leases Extended By Texas School Land Board

Texas State School Land Board has unanimously approved the extension of the first group of mineral leases under the provisions of House Bill 17, passed by the Fiftieth Legislature.

Certain state public school land mineral leases, prior to the enactment of this measure, carried an automatic 25-year limitation. Under the terms of the new legislation, the board may extend these leases for so long as commercial production of oil or gas is maintained.

The initial group of leases, for which application for extension had been made to the board, embraced approximately 7,840 acres in the west and east central sectors of Corpus Christi Bay, held principally by Atlantic Refining Co.

The new lease agreement will require an extension bonus payment of $105,650 which averages $13.46 an acre. It will also require the usual one-eighth royalty payment to the school fund.

A. I. M. E. Meeting Being Planned for Los Angeles

The American Institute of Mining and Metallurgical Engineers will hold its 1949 annual meeting in San Francisco, February 13-17. The meeting, under the chairmanship of William Mein, Jr., is timed to coincide with the centennial celebration of the California gold rush.

Technical sessions and luncheons will be held for all divisions of the A.I.M.E. Proposed field trips include Kettleman Hills, Rio Vista gas field, and Grass Valley and Yuba gold fields.

Headquarters for the meeting will be at the Fairmont Hotel and reservations may be made through A.I.M.E. Housing Bureau, Room 200, 61 Grove Street, San Francisco 2, Calif.

Continental Names Cram To New Vice Presidency

A NEW vice presidency at the head of the company's expanded exploration program has been created by Continental Oil Co., Ponca City, and the post has been filled by Ira H. Cram, formerly manager of exploration for Pure Oil Co., Chicago.

IRA H. CRAM

Cram has been associated with Pure since 1931, and has been manager of exploration since January 1948. He is a past president of the American Association of Petroleum Geologists.

The appointment follows a series of personnel changes in Continental announced during recent weeks by President L. F. McCollum. E. F. Battson, formerly New York vice president, is being shifted to Denver to be vice president and manager of Rocky Mountain activities, succeeding W. H. Ferguson who is due to retire. W. C. MacMillan, vice president in charge of production, is being elevated to the new post of vice president and administrative assistant to the president. E. W. Webb, formerly assistant manager of production, has been made manager of the production department and a number of other changes have been made in the personnel of the department.

McCollum also announced the election to Continental's board of directors of P. C. Lauinger, publisher of The Oil and Gas Journal and Petroleo Interamericano, Tulsa.

Next Week

5,000-Bbl. Cat Cracker.—The Journal's refining editor pays a visit to Pure Oil's new unit at Heath, Ohio, reports on process details and product yields.

Goldsmith Field, West Texas.—A Stanolind engineer describes his company's six-lease experimental gas-injection project.

Another New Byproduct.—Union Oil Co.'s new Santa Maria, Calif., plant is first to make dry ice from oil-well gas.

Better Well Completions.—Analyses from 250-plus cement-squeeze jobs, using mud acid ahead of cement.

World's Largest Dry-Gas Field?—A leading candidate for this title offers these qualifications: 4,070,820 proven acres, 2,003 wells, 5,304,316 M.c.f. deliverability per day, 27.5 trillion cubic feet reserve.

PERSONALS

J. B. Harshman Joins Utah Firm as General Manager

J. B. HARSHMAN, who recently completed his twenty-eighth year with Stanolind Pipe Line Co. and who has served as general manager of the company since 1945, has resigned to accept the position of general manager of Utah Oil Refining Co., Salt Lake City, Utah, and head of the pipe line department.

The Utah firm, effective January 1, 1949, will take over operation of its company owned pipe-line properties in Wyoming, Colorado, and Utah. These pipe-line properties were built for Utah Oil Refining by Stanolind Pipe Line as construction agent, and since completion, have been operated by Stanolind under contract. (See page 281, this issue.)

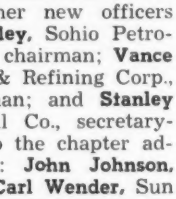
During World War I Harshman was employed by the Government in machine shops, after which he began his pipe-line career as a machinist with Prairie Pipe Line Co. in its Illinois division.

Harshman joined the organization that is today Stanolind Pipe Line Co. in 1920 when he took a job as engineer at a pump station at Bowie, Tex. Later he was assigned as a station engineer at the Hominy, Okla., pump station. He was next assigned as a machinist for the Oklahoma oil gathering areas.

In 1922 Harshman was assigned to construction projects in Illinois and Nebraska, taking part in the great expansion of pipe lines during the period which accompanied the development of major oil fields in the Southwest and in Wyoming. For 5 years he supervised construction and maintenance of machinery, and then was transferred to the Tulsa office in 1927 as lubrication engineer. He was promoted to master mechanic in 1930 and served in this position for 10 years.

In 1940 Harshman was placed in charge of operations with the title of general superintendent. He became general manager in 1945 and was elected to the board of directors January 1, 1947.

Earl Hartman, Gordon Oil Co., has been elected chairman of the Michigan chapter of the American Petroleum Institute. Other new officers include: **John Buckley,** Sohio Petroleum Co., first vice chairman; **Vance Orr,** Roosevelt Oil & Refining Corp., second vice chairman; and **Stanley Curtiss,** Gordon Oil Co., secretary-treasurer. Named to the chapter advisory board were: **John Johnson,** Chapman Oil Co.; **Carl Wender,** Sun Oil Co.; **Fred Turner,** Turner Petroleum Corp.; and **Lester LaFavour,** Gulf Refining Co., retiring chairman.



M. R. LENTS

Max R. Lents, director, vice president, and general manager of Old Ocean Oil Co. and J. S. Abercrombie Co., Houston, Tex., has resigned to become associated with J. R. Butler & Co., Houston. Lents is particularly well known for his engineering work in the field of gas cycling operations. Other changes in the Old Ocean and Abercrombie companies include: **J. P. Roetzel,** treasurer of Old Ocean, has been elected a director and vice president of that company; **Ben H. Williams,** formerly manager of operations in Old Ocean field, was elected a director, vice president and manager of operations of J. S. Abercrombie Co.; **Harry W. Elliott, Jr.,** has been named to succeed Williams as manager of operations in Old Ocean field; and **W. W. Prior** has been named as general counsel for both companies.

E. R. Wagner, plant superintendent at Stanolind Oil & Gas Co.'s Salt Creek gasoline plant, Midwest, Wyo., has been named plant superintendent at the company's new Slaughter natural-gasoline plant near Levelland, Tex. It is one of four to be completed by Stanolind early next year. The other three are, Elk Basin, Powell, Wyo.; Stano, Ulysses, Kans.; and Burnell-North Pettus, Pettus, Tex.

Dr. Samuel P. Ellison, Jr., until recently district geologist at Wichita Falls, Tex., for Stanolind Oil & Gas Co., has joined the University of Texas staff as professor of geology and consultant to its Bureau of Economic Geology and University Lands.

C. R. McMILLIN

C. R. McMillin, president of Standard Stations, Inc., subsidiary of Standard Oil Co. of California, has been elected an assistant vice president in charge of industrial relations for Standard Oil Co. of California. **Lowell E. Hunt,** manager of California Standard's Oakland marketing district since 1944, succeeds McMillin, and **R. M. Douglas,** formerly assistant manager of Standard's Seattle, Wash., district, will succeed Hunt as manager of the Oakland district.

Jay W. Wilson, manager of the Kansas City, Mo., sales field, for Standard Oil Co. (Ind.) for 22 years, will retire effective December 31. **H. E. Purdy,** assistant manager-reseller at Kansas City will succeed Wilson, who has spent all but three of his 37 years' service with the company in Kansas City.

James E. Coleman has been named purchasing agent of Manufacturers Light & Heat Co. and for its associated gas companies in the Pittsburgh group of the Columbia Gas System, Inc. He succeeds **John M. Simpson** who has retired.

J. W. Liddell, eastern sales manager at New York for Continental Oil Co., has been named to the newly created position of general manager of all company operations in the eastern region, with headquarters in New York. **J. R. Cunningham,** southern sales manager with headquarters in Fort Worth, succeeds Liddell as eastern manager. **L. R. Kump,** division marketing manager at Salt Lake City, Utah, will succeed Cunningham as southern sales manager.

Eugene P. Schoch, director of the bureau of industrial chemistry, University of Texas, received the first southwest regional award of the American Chemical Society December 10 Shreveport. Schoch was honored for his research resulting in a process for making acetylene from natural gas.

Walker Dabbs, with Humble Oil & Refining Co. in Louisiana, has been named superintendent for the recently established office at Colorado City, Tex., which will handle the company's exploration and production work on the east side of the Permian basin. The new district will operate under Humble's West Texas division with headquarters at Midland, Tex.

Emile E. Soubry, coordinator of marketing for Standard Oil Co. (N.J.), has been elected a member of the board of directors, effective January 1. Soubry, born in London and a naturalized United States citizen, started with the company and its affiliates as a clerk in the shipping department of Anglo American Oil Co., Ltd., in London in 1911. Just before World War II, he was appointed chairman of Anglo-American and during the war served on the British Oil Trade Committee and later as liaison between the committee and the U. S. Government. On his release from that work in 1943 he was appointed foreign marketing coordinator for Jersey Standard and has directed all marketing operations since October 1947.

Niles B. Winter, formerly district geologist for Atlantic Refining Co., has been named Midland division manager for the company at Midland, Tex. **R. T. Cox** has been named division geologist; **Stanley Smith,** district geologist for the New Mexico district; **R. E. Morgan,** district geologist for the South Permian Basin district; and **R. N. Watson,** district geologist for the North Permian and West-Central Texas district.

W. T. Hoey, Midland, Tex., consulting geologist, has been named district geologist for C. H. Murphy & Co. for West Texas and Southeast New Mexico. Hoey had previously served as district geologist for Plymouth Oil Co. The Murphy offices will be opened about the first of the year and will include a land department.

Ned Biffle, head of B & B Drilling Co., Pauls Valley, Okla., has been elected chairman of the Golden Trend production chapter of the American Petroleum Institute. He succeeds **W. E. Best,** engineer for Ohio Oil Co., who aided in the formation of the chapter about a year ago. Vice chairmen chosen were: **Jack Hudson,** superintendent of Republic Natural Gas Co., Pauls Valley; **Jack Gardner,** superintendent of Carter Oil Co., Purcell, Okla.; **W. L. Morse,** drilling superintendent for Sohio Petroleum Co., Elmore City, Okla.; and **Charles Brockman,** district engineer for The Texas Co., Maysville, Okla. **Kenneth Sawyer,** clerk for Pure Oil Co. at Pauls Valley, was named secretary-treasurer.

J. T. McGlothlin, zone geologist at Laurel, Miss., for Gulf Refining Co., will resign at the end of the year to become a consultant at Laurel.

E. M. Pinckard has been named in charge of Pure Oil Co.'s recently opened office in the Milam Building, San Antonio, Tex.

M. T. Stevens, formerly manager of the Moose Jaw refinery of British American Oil Co., Ltd., in Saskatchewan, has been appointed manager of the company's Calgary plant. **H. E. Hansen,** formerly assistant manager at Moose Jaw, succeeds Stevens as manager.

Harris Cox, vice president of Western Geophysical Co., has returned to his offices in Los Angeles, Calif., after a business trip through Brazil, Uruguay, Paraguay, and Argentina.

Earle F. Taylor, of DeGolyer & MacNaughton, Dallas, Tex., has been named in charge of the projects which that company will conduct in Uruguay for the petroleum department of the national government.

Walter Wells, drilling superintendent for Sinclair Petroleum Co. in Ethiopia, pictured here with a lion he killed about 50 miles from Sinclair's projected drilling site in the Ogaden desert, recently gained considerable acclaim from Ethiopian tribesmen not only for shooting the lion but also through drilling a prolific water well at Harrar for the Ethiopians. Wells, known for his wildcat drilling work in remote foreign areas, drilled the first well for the Sinclair organization in Venezuela and later in Colombia. The company is planning to spud in its Ethiopian test early in 1949

J. W. Emison, vice president and assistant general manager for Texas Pipe Line Co., has been named vice

J. W. EMISON

J. T. RYND

president and general manager. Earlier this year Emison, who has been with Texas Pipe Line since 1920, was elected a member of the board of directors for Texas-Empire Pipe Line Co. **J. T. Rynd,** assistant general manager of Texas Pipe Line, has been appointed vice president and assistant general manager for the company. He has been in pipe-line operations since joining the company in 1913.

Sidney H. Smith, Jr., formerly gas engineer for R. Lacy, Inc., in Longview, Tex., has resigned to become associated with **Thomas O. Payne** in Harlingen, Tex., as chief engineer.

James K. Smith, associated with a law firm in Galveston, Tex., has been named division attorney for Stanolind Oil & Gas Co. at Fort Worth, Tex. **Walter P. Dornaus,** attorney in the company's Fort Worth law department, will be transferred to the Tulsa general office, and **Ernest B. Helsley,** employment supervisor in Stanolind's Tulsa general office, will be transferred to the Fort Worth division legal staff.

Jose Martorano Battisti, chief of the national petroleum bureau of Venezuela, has returned to Caracas after a 6-week trip to Sweden and England. Battisti led a Venezuelan commission to study the ore reduction processes used by the mills in those countries.

Recent transfers and promotions of Stanolind Oil & Gas Co. plant superintendents in the Texas-Louisiana Gulf Coast include: **E. J. Yocom,** superintendent at the South Jennings recyling plant, Jennings, La., to the Hastings gasoline plant, Alvin, Tex., to succeed **C. W. Ward,** who has been made superintendent of the new Elk Basin plant, Powell, Wyo.; **H. W. Jones,** plant foreman at Superior refinery, Vivian, La., to superintendent at the South Jennings plant to succeed Yocom; **V. E. O'Donnell,** plant foreman at La Rosa recycling plant,

PERSONALS

Woodsboro, Tex., to superintendent of the Luby gasoline plant, Bishop, Tex. He succeeds the late H. J. Olinger.

Errol J. Hesser, Gulf Coast drilling superintendent for Rowan Drilling Co., has resigned to join British American Oil Producing Co. as production superintendent for the Gulf Coast division, with headquarters in Houston, Tex.

Lynn K. Lee, assistant to the manager of the Texas producing division for Pure Oil Co., has been named manager of exploration for the company to succeed **Ira H. Cram,** who has resigned. **Karl A. Mygdal,** reservoir engineer in the Texas producing division for Pure, has been named chief reservoir engineer in the geological department effective January 1. **Paschal Martin,** chief production engineer for the division, has been appointed assistant to the chief production engineer of the company. All will be headquartered in Chicago, Ill. Other promotions in the Texas producing division of Pure include: **James L. Morris,** chief division geologist, to succeed Lee as assistant to the division manager; **Melvin D. Mauck,** district geologist at Midland, Tex., to assistant division geologist at Fort Worth; **Raymond A. Rantala** to succeed Mygdal as reservoir engineer in the geological department, with headquarters in Fort Worth; and **Jack T. Duree,** assistant production engineer, succeeds Martin as chief production engineer.

Robert Matteson, head of the analytical laboratory at the Richmond laboratories of California Research Corp., a subsidiary of Standard Oil Co. of California, has been named chairman of the San Francisco Engineering Council, an organization made up of 11 major engineering and technical societies.

SHIFTS—

R. W. Horton, apprentice engineer, Phillips Petroleum Co., Odessa to Pampa, Tex.; **C. Moore,** apprentice engineer, Phillips Petroleum Co., Odessa, Tex., to Goodwell, Okla.; **Bruce Echo Hawk,** foreman, Century Geophysical Corp., Portales, N. M., to Kermit, Tex.; **W. M. O'Reilly,** engineer, Humble Oil & Refining Co., Beaumont to Lolita, Tex.

Stanley E. Spurgeon, engineer, Phillips Petroleum Co., Corpus Christi to Alvin, Tex.; **C. E. Ullrich,** engineer, Humble Oil & Refining Co., Katy to Houston, Tex.; **Lloyd Hanson,** superintendent, Arrow Drilling Co., Odessa to Robert Lee, Tex.; **H. M. Hovis,** superintendent, Shell Pipe Line Corp., Port Neches to Austin, Tex.; **R. C. McCay,** engineer, The Texas Co., Port Arthur, Tex., to New York; **Bruce R. Miller,** engineer, Ohio Oil Co., Port Arthur to Freeport, Tex.

Charles H. Thurber, engineer, Plymouth Oil Co., San Angelo to Cotulla, Tex.; **Grant S. Darnell,** engineer, Stanolind Oil & Gas Co., Lake Charles, La., to Tulsa; **W. C. Guess,** foreman, Sun Oil Co., Morgan City to Lake Charles, La.; **Douglas E. Bell,** geologist, Humble Oil & Refining Co., New Orleans, La., to Houston; **Kenneth R. Caldwell,** engineer, Gasoline Plant Construction Corp., Ville Platte, La., to Corpus Christi, Tex.; **D. M. Liles,** foreman, Stanolind Oil & Gas Co., Vivian, La., to Ulysses, Kans.

H. G. Walter, geologist, Ohio Oil Co., Tallahassee, Fla., to Columbus, Ohio; **J. A. Tierney,** geologist, Gulf Refining Co., Tallahassee, Fla., to Shreveport, La.; **George T. Snyder,** engineer, Socony-Vacuum Oil Co., Inc., East St. Louis, Ill., to Afton, Mo.; **W. K. Hastings,** geologist, Gulf Research & Development Co., Mount Vernon, Ill., to Douglas, Wyo.; **Arnold F. Lewis,** superintendent, Clemens Exploration Co., Newaygo, Mich., to Princeton, Ind.

Robert Tickle, foreman, Gulf Oil Corp., Laurel to McComb, Miss.; **Wesley M. David,** foreman, The Texas Co., Dodge City, Kans., to Perryton, Tex.; **John V. Morgan,** engineer, Stanolind Oil & Gas Co., Ellinwood to Zenith, Kans.; **Horace L. Temple,** engineer, Continental Oil Co., Lyons, Kans., to Ponca City, Okla.; **H. F. Thompson,** foreman, Atlantic Refining Co., Wellington to Lyons, Kans.; **Harold E. Arnold,** engineer, Shell Oil Co., Inc., Wichita, Kans., to Bellaire, Tex.

John J. Gibbens, engineer, Shell Oil Co., Inc., Wichita, Kans., to Centralia, Ill.; **Deane E. Kilbourne,** geologist, The Texas Co., Lewiston, Mont., to Craig, Colo.; **M. G. Trusdel,** engineer, The Texas Co., New Iberia to New Orleans, La.; **J. L. Fusselman,** engineer, The Texas Co., Cody to Casper, Wyo.; **J. B. Scott,** engineer, Phillips Petroleum Co., Bartlesville, Okla., to Pasadena, Tex.; **L. C. Jarrell,** engineer, The Texas Co., Tulsa to Ardmore, Okla.

DEATHS

Solomon R. Mealy, 71, senior member of Mealy-Wolfe Drilling Co., died December 26 in Tulsa. Mealy became active in the oil industry in 1913 when he joined the late A. R. Thomas in organizing the Rogers County Drilling Co., later reorganized as Commercial Drilling Co. In 1933 when the National Recovery Act was approved Mealy was elected president of the Oklahoma-Kansas drilling contractors.

Paul R. Johnson, president for more than 20 years of Union Gas System, Inc., and its producing subsidiary, Sagamore Oil & Gas Co., died December 17 in Independence, Kans.

Mathew Craddock, 59, district pipeline foreman at Superior, Iowa, for the past 8 years for Northern Natural Gas Co., died December 5 in Owatonna, Minn.

Edward S. Ryan, 70, stationary engineer for the Bayway refinery of Esso Standard Oil Co. for 21 years before his retirement in 1943, died December 16 in Elizabeth, N. J.

John J. Hayes, 49, chief accountant for International Cooperative Petroleum Association in New York, died December 15 in New Rochelle, N. Y.

Harvey V. Wickliff, 85, credited by Standard Oil Co. (Ohio) with starting the first gasoline filling station in the United States, died December 25 in Columbus, Ohio.

Bryce Gillespie, 64, assistant treasurer and assistant controller of General Petroleum Corp., died December 17 in Glendale, Calif. He joined General Petroleum in 1912 as a materials clerk on construction work at Wilmington.

J. Holly Hayter, 60, assistant purchasing agent for Tide Water Associated Oil Co. at Los Angeles for 26 years, died December 19 in Los Angeles.

Luther F. Robinson, 46, pumper for Schermerhorn Oil Co. for 25 years, died December 20 in Clemscot, Okla.

Elliott Hancock, 66, pioneer Oklahoma driller, died December 20 in Drumright, Okla. He had been active in the oil drilling industry for 50 years.

Walter B. Fulton, chief engineer of Interstate Oil Pipe Line Co. from 1945 until his retirement this year and a veteran of 30 years' service with affiliates of Standard Oil Co. (N.J.), died December 12 in Shreveport, La.

J. W. Valentine, 59, East Texas oil lease broker, died December 18 in Palestine, Tex.

Richard McDougall, 50, zone supervisor at Esso Standard Oil Co.'s refinery in Linden, N. J., died December 15 in Roselle, N. J.

The Oil and Gas Journal's Report

on

International OIL

Drilling

Rotary rigs, operating in countries outside the United States, Canada, Russia, and Russian-dominated areas, have reached a total of 499 for a gain of 13 per cent over last year and 37 per cent over the number in operation near the end of 1946. The continuing world-wide search for oil is indicated by expansion programs that call for the addition of 180 more rigs within the next 2 years.

Production

Crude-oil production outside the United States and Russian-controlled areas reached 3,363,100 bbl. daily late in the year and averaged 3,081,900 bbl. per day for the 12 months. The Middle East area set the pace with a gain of 285,300 bbl. daily or 34.1 per cent over 1947. Venezuela continued as the major producer with an average of 1,330,000 bbl. per day. The highest relative gain was set by the Far East area with an increase of 117.3 per cent.

Pipe Line

For 1948 and the future, petroleum and natural-gas pipe-line-construction programs outside the United States total 12,000 miles. Crude-oil projects predominate with 3,100 miles completed and under construction; 4,000 miles are planned. Initial capacity of crude-oil lines in the Middle East will be around 1,500,000 bbl. daily; much larger potential capacity will be possible with later additional facilities. Programs for products lines total 2,100 miles; for natural-gas lines, 3,880 miles.

Refining

During 1949 world refining capacity will total nearly 10 million barrels daily. This capacity will be supplied by more than 650 refineries, of which approximately two-thirds are located in North America. New refineries and expansion of most of the plants now operating comprise a tremendous building program throughout the world. The 10-million-barrel per day capacity scheduled for late 1949 includes only those expansion projects which are either under way or authorized. An additional 500,000 bbl. of daily capacity is likely to be authorized soon for construction outside of the United States. New plants alone will account for 200,000 bbl. daily of this half-million-barrel capacity

AN ANNUAL FEATURE

Global Oil Reserves

. . . . A CURRENT REPORT . . . .

DATA ON PROVEN

	Proved and indicated reserve as of Jan. 1, 1949	Production data: Approximate production during 1st 6 months of 1947	Production data: Approximate production during 1st 6 months of 1948	Increase or decrease in 1948	Per cent increase or decrease
WESTERN HEMISPHERE					
Antilles:					
Cuba	*3,000,000	154,000	137,000	†17,000	†11
North America:					
Canada	500,000,000	3,687,000	4,987,000	1,300,000	35
Mexico	850,000,000	27,020,000	28,550,000	1,530,000	6
United States	28,000,000,000	891,505,000	998,010,000	106,505,000	12
Totals and pct. North America	29,350,000,000	922,212,000	1,031,547,000	109,335,000	12
South America:					
Argentina	*250,000,000	7,303,000	8,297,000	994,000	14
Bolivia	15,000,000	153,000	218,000	65,000	42
Brazil	15,000,000	50,000	63,000	13,000	26
Chile	10,000,000				
Colombia	300,000,000	12,252,000	9,650,000	†2,602,000	†21
Ecuador	30,000,000	1,121,000	1,326,000	205,000	18
Peru	160,000,000	5,255,000	6,758,000	1,503,000	29
Trinidad	250,000,000	9,924,000	10,077,000	153,000	15
Venezuela	9,000,000,000	208,720,000	238,352,000	29,632,000	14
Totals and pct. South America	10,030,000,000	244,778,000	274,741,000	29,963,000	12
Total Western Hemisphere	39,383,000,000	1,167,144,000	1,306,425,000	139,281,000	12
EASTERN HEMISPHERE					
Africa:					
Algeria	*1,000,000	10,000	4,000	†6,000	†60
Egypt	120,000,000	4,182,000	5,639,000	1,457,000	35
French Morocco	*1,000,000	7,000	29,000	22,000	314
Totals and pct. Africa	122,000,000	4,199,000	5,672,000	1,473,000	35
Asia—Far East:					
Burma	*50,000,000	100,000	100,000		
China	*20,000,000	175,000	269,000	94,000	54
India	*25,000,000	904,000	965,000	61,000	7
Japan	*15,000,000	648,000	600,000	†48,000	†7
Pakistan	*7,000,000	182,000	231,000	49,000	27
Sakhalin	*75,000,000	3,400,000	3,700,000	300,000	9
Totals and pct. Far East	192,000,000	5,409,000	5,865,000	456,000	8

By E. DeGOLYER

WE estimate the world's proved oil reserves as of the first of 1949 will be 78.322, let's say 80 billion barrels. This oil is distributed approximately equally between the Eastern and Western Hemispheres. More than a third is in the United States and substantially more than a third in the Middle East.

Any estimate of oil reserves, even of proved oil reserves, is a guess. It may be an intelligent guess made by a trained estimator of broad experience. It may be guided and restrained by many observed field data and by many mathematical computations. But it remains a guess. In estimates of nation-wide areas, such as the one presented herewith, there is not even an agreed standard as to what is being estimated. A new field is discovered in the United States, let us say in December. Let us assume that the contour of the producing sand is reasonably well known from geophysical surveys and that the electric log of the discovery well shows a substantial sand thickness, a deep zone of penetration, and a high rate of production. One engineer may consider that these data have proved or indicated an addition to the reserves of the state and nation of 25 to 50 million barrels of oil. Another estimator may give the discovery what is little if any more than a token credit of 1 or 2 million barrels.

The great difficulty lies in our inability at any time to appraise fully the results of discovery made within the preceding 3 to 4 years. Experience has taught us that appraisals of a newly discovered field, made at the end of the year of discovery, are generally increased as development proceeds. Upon the completion of development, usually 3 to 4 years after discovery, the estimate of oil reserves

E. DeGolyer is senior member of the firm of DeGolyer & MacNaughton, Dallas. Long active in petroleum - industry circles, covering both domestic and foreign operations, he has been the recipient of some of the highest honorary awards, among them the distinguished service award of the Texas Division, Mid-Continent Oil and Gas Association; the A.I.M.E.'s Anthony F. Lucas medal, and the John Fritz medal, of the Four Founders Society. A native Kansan, he is a graduate of University of Oklahoma, and is a former member of the U. S. Geological Survey, and of the faculty of University of Texas. He was the first engineer to recognize the importance of geophysical methods of oil prospecting.

WORLD OIL RESERVES

	Proved and indicated reserve as of Jan. 1, 1949	Production data: Approximate production during 1st 6 months of 1947	Production data: Approximate production during 1st 6 months of 1948	Increase or decrease in 1948	Per cent increase or decrease
Asia—Malaya:					
British Borneo	*150,000,000	1,180,000	2,566,000	1,386,000	117
Dutch East Indies	*1,000,000,000	3,742,000	19,693,000	15,951,000	426
New Guinea	50,000,000	0	0	.....	....
Totals and pct. Malaya	1,200,000,000	4,922,000	22,259,000	17,337,000	352
Asia—Middle East:					
Bahrein	170,000,000	3,475,000	5,504,000	2,029,000	58
Iran	7,000,000,000	72,053,000	87,974,000	15,921,000	22
Iraq	5,000,000,000	16,479,000	14,611,000	†1,868,000	†11
Kuwait	10,950,000,000	7,530,000	15,030,000	7,500,000	10
Qatar	500,000,000	.....	.....	.....	....
Saudi Arabia	9,000,000,000	39,811,000	60,354,000	20,543,000	52
Turkey	1,000,000	0	0	0	0
Totals and pct. Middle East	32,621,000,000	139,348,000	183,473,000	44,125,000	32
Totals and pct. Asia	34,013,000,000	149,679,000	211,597,000	61,918,000	41
Europe:					
Albania	*9,000,000	337,000	324,000	†13,000	†4
Austria	*75,000,000	3,555,000	3,822,000	267,000	8
Czechoslovakia	*2,000,000	78,000	71,000	†7,000	†9
France	*4,000,000	170,000	186,000	16,000	9
Germany	*45,000,000	1,925,000	2,069,000	144,000	7
Great Britain	4,000,000	187,000	166,000	†21,000	†11
Hungary	*40,000,000	2,300,000	1,831,000	†469,000	†20
Italy	*1,000,000	43,000	45,000	2,000	5
Netherlands	50,000,000	606,000	1,458,000	852,000	141
Poland	*20,000,000	477,000	534,000	57,000	12
Romania	*350,000,000	13,842,000	14,433,000	591,000	4
U.S.S.R.	*4,200,000,000	89,233,000	105,000,000	15,767,000	18
Yugoslavia	*4,000,000	215,000	200,000	†15,000	†7
Totals and pct. Europe	4,804,000,000	112,968,000	130,139,000	17,171,000	15
Total Eastern Hemisphere	38,939,000,000	266,846,000	347,408,000	80,562,000	30
Total World	78,322,000,000	1,433,990,000	1,653,833,000	219,843,000	15

*Estimates, little better than guesses, but made against background of previous estimates from various sources. Total reserve in this category, including U.S.S.R., is 6.347 billion barrels or 8.0 per cent of total estimated reserves.
†Decrease.

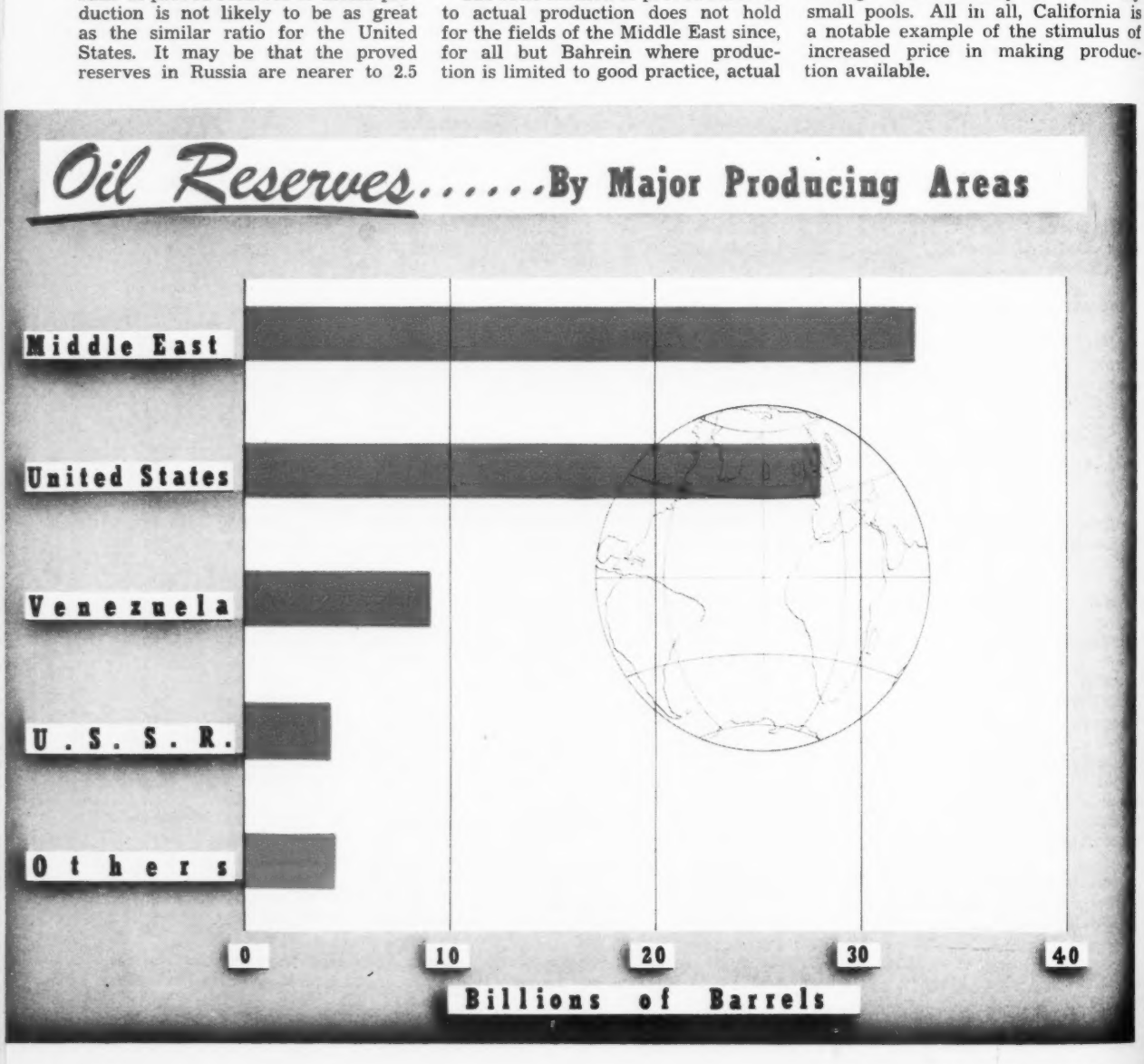
proved is likely to have been increased by 200 to 300 per cent over the original estimate.

We know less about the oil reserves of the U. S. S. R. at the present time than any other region. Fairly good information was available until the outbreak of war, 10 years ago. Since that time only fragmentary reports have been available on this side of the iron curtain, even the rate of production being a matter of speculation rather than knowledge. The proved reserves are estimated at 4.2 billion barrels of oil. This is believed to be too high an estimate rather than too low. It is obvious that ability to produce is a function of proved reserves. If one assumes that the Russians follow the same pattern in production practice that they have followed in the past and that they have imposed on fields in satellite countries, they are still in open-flow technology. Under such conditions the ratio of proved reserves to actual production is not likely to be as great as the similar ratio for the United States. It may be that the proved reserves in Russia are nearer to 2.5 billion barrels than to the 4.2 billion barrels estimated.

In scanning the whole statistical history of oil production in Russia, the question as to whether the Russians are likely ever to be able to increase rapidly their present rate of production suggests itself. Of all human enterprises, prospecting for oil seems to prosper most under a relatively free economy. It is the thousands of American wildcatters—thousands of independent managements where a decision may be taken—who are able to discover new oil fields at the rate required by our economy. Multiple effort is as essential in oil finding as it is in solving the problems of science. Under the rigidly regimented economy of the U. S. S. R., it would seem to be difficult to increase discovery rate, even though the potential reserves of that nation are generally estimated to be greater than those of our own country.

The ratio method of proved reserves to actual production does not hold for the fields of the Middle East since, for all but Bahrein where production is limited to good practice, actual production is restricted by outlets, by restriction in transportation facilities, and in markets. Reserves and potential reserves are likely to continue to be so greatly in excess of those required for actual production that it makes little difference, for example, whether the reserves of a single nation, such as Saudi Arabia or Iran, be estimated at 7, 9, or 11 billion barrels.

In the detailed study of the reserves of the United States which has led to the present estimate, it is noteworthy that California has been able to maintain its production at so high a rate. Defining a major field as one with ultimate reserves of 100 million barrels or more, no such field has been discovered within the past 10 years. Production has been maintained chiefly through the discovery of deeper sands, extensions and the drilling of inside locations. There have been some additions to reserves through the discovery of relatively small pools. All in all, California is a notable example of the stimulus of increased price in making production available.



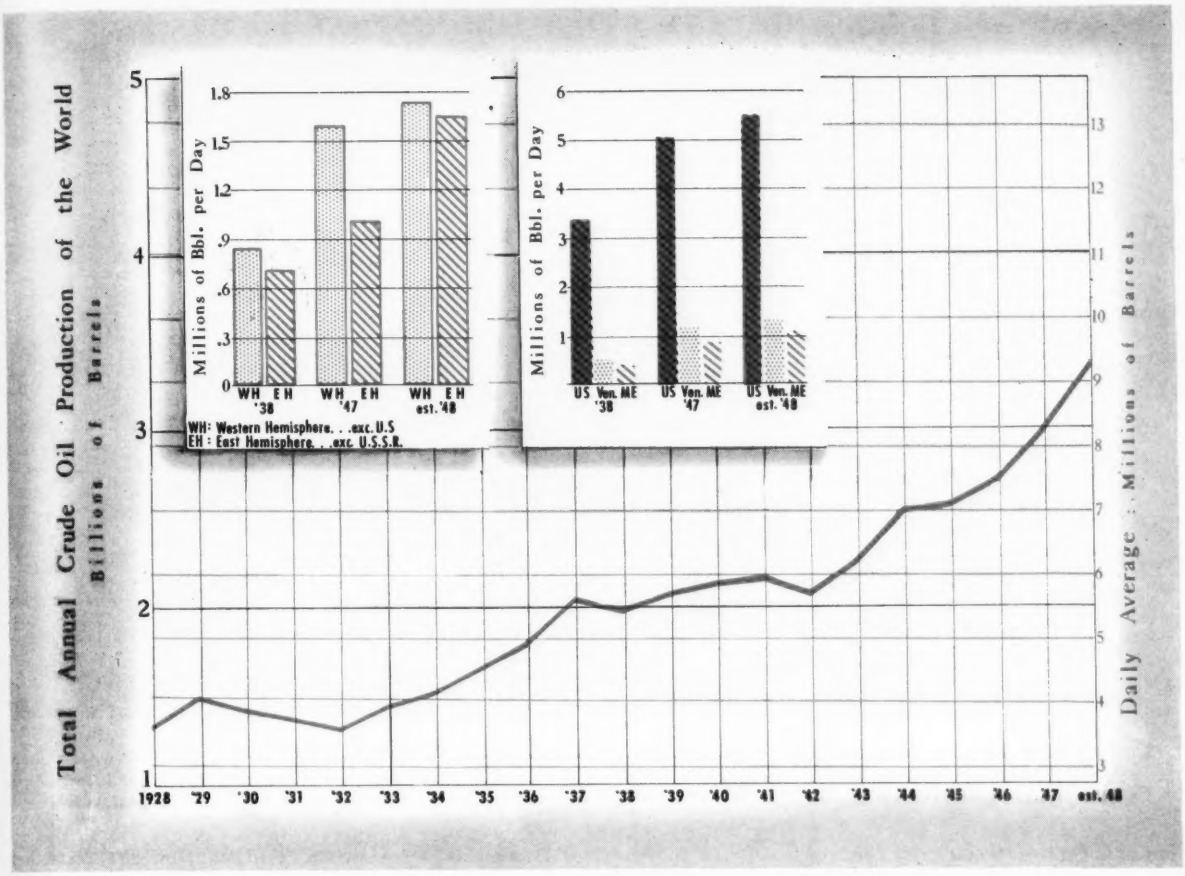

Total Annual Crude Oil Production of the World
Billions of Barrels
Daily Average — Millions of Barrels
Millions of Bbl. per Day
WH EH '38
WH EH '47
WH EH est.'48
WH: Western Hemisphere. . .exc. U.S
EH : East Hemisphere. . .exc. U.S.S.R.
US Ven. ME '38
US Ven. ME '47
US Ven. ME est.'48
1928 '29 '30 '31 '32 '33 '34 '35 '36 '37 '38 '39 '40 '41 '42 '43 '44 '45 '46 '47 est.'48

Chart showing hemispheric relationships, and country comparisons in production, 1938, 1947, 1948

FOREIGN PRODUCTION UP 21.2%

Exclusive of Russian-Controlled Countries Now 3,363,100 Bbl. Daily

by Dahl M. Duff

ANOTHER record-breaking total of 1,127,966,000 bbl. of crude oil was produced in 1948 in countries outside the United States, Russia, and Eastern Europe.

The producing rate was at an estimated average of 3,081,900 bbl. daily throughout the year, and represents an increase of 21.2 per cent over 1947. The steadily rising trend of oil production world-wide also is emphasized by the estimated current producing rate of 3,363,100 bbl. daily, a 9.1 per cent increase over the average for 1948 itself.

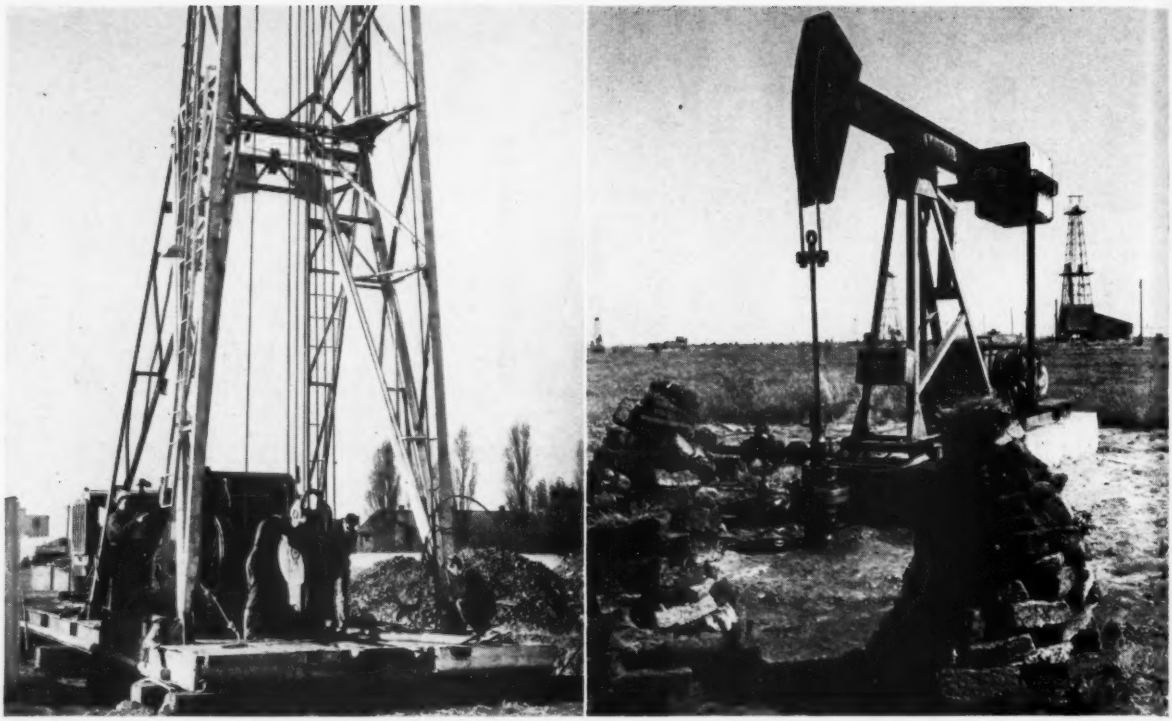
Oil production in virtually all producing countries was pushed to the maximum levels required to satisfy an unprecedented world demand. Rebuilding in Europe, industrialization in Latin America, and the growing use of petroleum for heating as well as transportation contributed to the tremendous demand which is reflected in the production figures for crude oil.

Eastern Europe Still Question

Information on oil production in Eastern Europe continues to be meager. Best available data indicate these countries produced oil at a daily average of 693,200 bbl. daily in 1948, an increase of about 6 per cent over 1947. United States crude-oil production is placed at 5,510,000 bbl. daily for the year. Thus, world output of petroleum in 1948 averaged an estimated 9,285,100 bbl. daily, a gain of 12.1 per cent over 1947. Total production for the year was 3,398,037,000 bbl.

The Middle East area contributed most heavily to the increased output of crude oil in 1948. Production in this area was up 34.1 per cent over 1947 for the daily average during 1948 of 1,123,000 bbl. A gain of nearly 10 per cent was made in Western Hemisphere output exclusive of the United States. The daily average was 1,749,700 bbl. daily, with Venezuela's output at 1,330,000 bbl. daily, up 11.7 per cent.

Crude production in Western Europe and Egypt, though small in relation to the world total and the



Left: Oil exploration in England—the 94-ft. portable rotary shown here is rigging up at Willesden, London, N.W., for 4,000-ft. test; location is in the middle of a park. Right: New pumping well in Germany—owned by Gewerkschaft Brigitta (50 per cent Shell and 50 per cent Standard Esso)—location in the Steimbke oil field in a moor and forest area. Mounds in foreground are cut peat rocks

requirements of this heavy consuming area, showed a gain of more than a third, due principally to the two new fields in Egypt and rapid development of production in The Netherlands.

In the Far East, production, principally in British Borneo and Indonesia, more than doubled the 1947 rate. The 1948 daily average for the Far East is placed at 151,000 bbl. daily. Despite this gain, production in this region was still about 28 per cent below the prewar year of 1938 because of continued unfavorable political conditions in Burma, Java, and Sumatra.

Country-by-country figures on 1948 production compared with that for 1947 and 1938 are listed in the accompanying table. The 1948 data represents actual production except for the closing months of the year for which estimates were made to arrive at the figures shown. For Eastern Europe and Russia, estimates were made for the entire year on the basis of private reports and what little official information has been made public.

The current 1948 production given in the table is the latest available figure for the country concerned. For the Middle East and the more important producing countries in the Western Hemisphere, the current figure represents October. The 1938 production is from reports of the U. S. Bureau of Mines.

U. S. Per Cent Decreases

The rising curve of oil production outside the United States is also brought out by the fact that the percentage of world output by the United States dropped to 59.4 in 1948. United States production was figured at more than 66 per cent of the world's total in 1945 but this percentage has been declining slightly each year since.

United States crude production rose 8.4 per cent from 1947 to 1948 but this gain is exceeded, percentagewise, by production in all foreign areas which was up 18.1 per cent. Excluding Russia and Eastern Europe, the increase in foreign production was 21.2 per cent.

Comparing 1948 production with that in the prewar year of 1938, total foreign increased 79 per cent; foreign less Russia and Eastern Europe, 120.4 per cent; the United States 65.7 per cent; and total world, 70.8 per cent.

The Middle East area continues to hold major attention. It has increased its production 242 per cent over the 328,200 bbl. daily average of 1938. During the past year Middle East oil found its way into all the world's major markets, including the United States.

Middle East

The current production total in the Middle East of 1,316,000 bbl. daily is expected to rise to 2,000,000 bbl. daily or more on completion of the several Persian Gulf-Mediterranean pipe lines now under construction or planned. The Middle East is destined to supply most of the needs of Europe and supplement requirements elsewhere in the Eastern Hemisphere.

Production in Kuwait, now more than 200,000 bbl. daily, has shown a phenomenal rise in the last 18 months. Burhgan field in this small independent sheikdom at the head of the Persian Gulf is now ranked as perhaps the world's largest single oil reservoir. Output in Kuwait is expected to at least double in the next year or two.

Among the marked increases in production made in other Middle East countries in 1948, the 31.5 per cent drop in output of Iraq stands out. This is the direct result of the Arab-Jewish fighting which halted the flow through the Palestine leg of the Iraq-Mediterranean pipe lines. Like other Middle East countries, Iraq's production is limited to transportation facilities, and closing of the Palestine line late last spring practically cut in half the normal 90,000-bbl. daily production of Iraq Petroleum Co., Ltd. There are no indications at present when this line will be reopened.

Production in Saudi Arabia by Arabian American Oil Co. showed a gain of 58.3 per cent in 1948 to about 390,000 bbl. daily during the year. Iran continued to hold its place as the world's third largest producing country with an estimated 1948 daily

average of 510,000 bbl., up 20.9 per cent from 1947. Bahrein output showed a smaller increase of 16.3 per cent to 30,000 bbl. daily in 1948.

No commercial production was made during the year in Qatar, although drilling operations continued by Petroleum Development (Qatar), Ltd., an Iraq Petroleum Co. associate. Reserves here have been estimated at about 1,000,000,000 bbl., and production is expected to begin in 1950.

Venezuela

Nearly 76 per cent of all oil produced in the Western Hemisphere outside the United States came from Venezuela. The importance of this country in meeting world demand is illustrated by the fact that its production has risen 158.1 per cent over the 515,500 bbl. daily produced in 1938.

Exploration continues at a high level throughout Venezuela, and such developments as the discovery of deep Cretaceous limestone pay formations in Western Venezuela promise that production will remain at a sustained high rate indefinitely. Venezuela's current production of 1,369,800 bbl. daily is about 3 per cent above the 1,330-bbl. daily average for the year.

Canada

Probably the most noteworthy development in the Western Hemisphere is the rapid rise in 1948 output in Canada following the discovery of Leduc field and other production in Alberta. These discoveries reversed the decline in Canadian production and the 1948 output of 30,500 bbl. daily represents an increase of nearly 52 per cent over 1947. Current production is about 40,000 bbl., another 10,000 bbl. daily gain, and further large increases are anticipated as drilling continues.

(Continued on page 184)

Table 1—World Crude-Oil Production, 1938, 1947, 1948

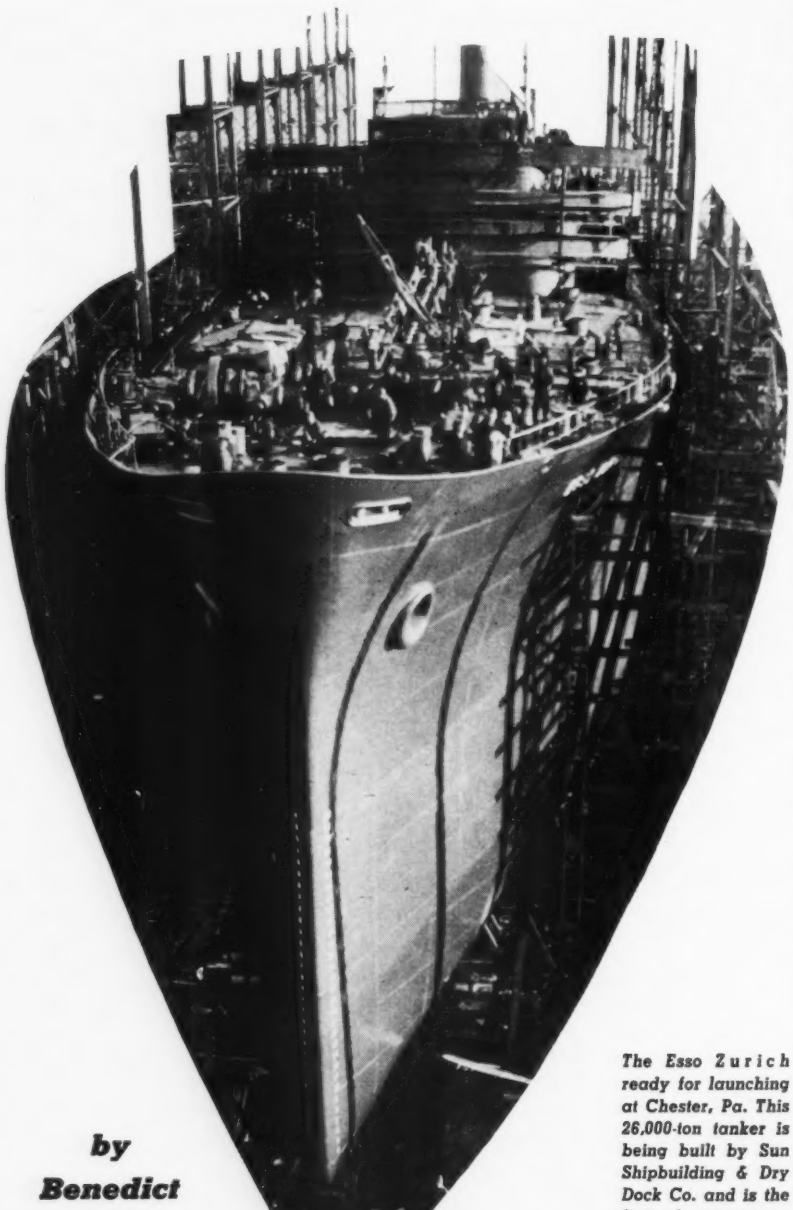
(In thousands of barrels)

Country—	1948 Current* daily average	1948 Estimated year's dly. avg.	1948 Estimated year's total	1947 Daily average	1947 Year's total	1938 Daily average	1938 Year's total	Percentage increase† 1948 over 1947	Percentage increase† 1948 over 1938
Argentina	61.9	63.5	23,248	59.9	21,847	46.8	17,076	6.0	35.6
Bolivia	1.5	1.3	476	1.3	489	0.6	226	....	116.6
Brazil	0.4	0.3	110	0.3	97	....	.....	....	....
Canada	40.0	30.5	11,143	20.1	7,302	19.1	6,966	51.8	59.7
Colombia	82.5	62.0	22,692	68.1	24,843	59.1	21,582	—8.9	4.9
Cuba	0.7	0.7	256	0.7	250	....	.....	....	....
Ecuador	7.5	7.4	2,708	6.6	2,426	6.2	2,246	12.1	19.4
Mexico	163.7	160.0	58,560	153.8	56,130	105.5	38,506	4.0	51.7
Peru	40.0	38.0	13,908	34.9	12,764	43.4	15,839	8.9	—12.5
Trinidad	55.1	56.0	20,496	55.7	20,344	48.6	17,737	0.5	15.2
Venezuela	1,369.8	1,330.0	486,780	1,190.8	434,640	515.5	188,174	11.7	158.1
Total Western Hemisphere less U. S.	1,823.1	1,749.7	640,377	1,592.2	581,132	844.8	308,352	9.9	107.2
France	1.1	1.1	403	1.0	380	1.4	513	10.0	—21.4
Germany (W. zone)	12.6	11.5	4,209	11.0	4,015	10.6	3,861	4.5	8.5
Italy	0.2	0.2	73	0.2	86	0.3	101	....	—33.3
Netherlands	11.3	9.5	3,477	4.0	1,478	....	.....	137.8	....
Egypt	34.0	35.0	12,810	25.5	9,317	4.3	1,581	37.3	714.0
United Kingdom	0.9	0.9	329	1.0	350	....	.....	—10.0	....
Total West Europe and Africa	60.1	58.2	21,301	42.7	15,626	16.6	6,056	36.3	250.1
Bahrein	30.6	30.0	10,980	25.8	9,411	22.7	8,298	16.3	32.2
Iran	559.0	510.0	186,660	422.0	154,086	214.7	78,372	20.9	137.5
Iraq	53.5	68.0	24,888	99.2	36,205	89.4	32,643	—31.5	—24.0
Kuwait	205.0	125.0	45,750	44.5	16,228	....	.....	180.8	....
Saudi Arabia	468.7	390.0	142,740	246.2	89,852	1.4	495	58.3	27,800.0
Total Middle East	1,316.8	1,123.0	411,018	837.7	305,782	328.2	119,808	34.1	242.2
British Borneo	58.1	54.5	19,947	36.1	13,170	18.9	6,913	51.0	188.5
Burma	0.6	0.5	183	0.6	201	20.7	7,538	—16.7	—97.5
China	1.9	1.8	659	1.1	396	....	.....	63.7	....
India	6.6	6.5	2,379	6.1	2,240	6.8	2,488	6.6	—4.4
Indonesia (N.E.I.)	92.4	84.4	30,894	22.0	8,030	157.0	57,318	283.5	—46.2
Japan	3.5	3.3	1,208	3.6	1,315	6.9	2,511	—8.4	—52.1
Total Far East	163.1	151.0	55,270	69.5	25,352	210.3	76,768	117.3	—28.2
Total foreign, less Russia and E. Europe	3,363.1	3,081.9	1,127,966	2,542.1	927,892	1,399.9	510,984	21.2	120.2
Albania	1.0	1.0	366	1.0	365	2.1	752	....	—52.4
Austria	18.0	20.0	7,320	15.9	5,826	1.0	383	25.8	1,900.0
Czechoslovakia	0.4	0.4	146	0.6	240	0.4	130	—33.3	....
Hungary	9.8	10.0	3,660	11.9	4,332	0.8	288	—16.0	1,150.0
Poland	2.8	2.7	988	2.6	949	10.3	3,763	3.8	—74.0
Romania	83.2	78.0	28,548	78.0	28,473	132.8	48,487	....	—41.4
Russia	590.0	580.0	212,280	543.0	198,195	561.5	204,956	6.8	3.3
Yugoslavia	1.1	1.1	403	1.0	365	....	.....	10.0	....
Total Russia and Eastern Europe	‡706.3	693.2	253,711	654.0	238,745	708.9	258,759	6.0	—2.2
Total foreign	4,069.4	3,775.1	1,381,377	3,196.1	1,166,637	2,108.8	769,743	18.1	79.0
United States	5,646.0	5,510.0	2,016,660	5,085.2	1,856,107	3,326.7	1,214,355	8.4	65.7
Total world	9,715.4	9,285.1	3,398,037	8,281.3	3,022,744	5,435.5	1,984,098	12.1	70.8

*For most of the larger producing countries, data are as of October. In other cases, figure represents latest available information, generally August or September. †Figured on basis of daily averages, using for 1948 the estimated year's daily average. ‡Data for this group of countries are estimates only for 1948 and 1947. No official or reliable figures are available.

TANKER-Construction Program at New Peak for Peacetime..

Especially prepared for this issue of the Journal, this article presents comprehensive statistics on present tanker inventory; size, speed, and age distribution; ownership; and the construction program.



The Esso Zurich ready for launching at Chester, Pa. This 26,000-ton tanker is being built by Sun Shipbuilding & Dry Dock Co. and is the first of new supertank fleet of Standard Oil Co. (N. J.) to be launched

by Benedict Saurino

A PHENOMENAL resurgence of tanker construction has occurred during the past year. Presently, there are under construction and/or on order 440 vessels of 7,453,080 deadweight tons. These ships are equivalent to nearly 430 T2's. The largest constructor nation is the United Kingdom which has 38.3 per cent of the total program on its books, while second in magnitude is the United States with a program representing 28.1 per cent of the new construction and third is Sweden having 17.8 per cent of the total. These three countries have nearly 85 per cent of the present total construction program throughout the world.

Largest of the recipient nations is Norway, which has placed orders for 156 T2 equivalents, accounting for 35.8 per cent of the total program. The United States and Panama combined will receive 32.6 per cent of the new construction, while Great Britain will acquire 16.5 per cent of the total capacity represented by the new vessels. These four nations, therefore, will acquire approximately 85 per cent of the present capacity under construction.

Inventory

In actual terms, world tank-ship fleets on January 1, 1949, aggregated 1,872 vessels of 15,459,372 tons gross, having a deadweight of 23,815,800 tons with an average speed of 13.0 knots. In terms of T2-SE-A1 equivalents, for the conversion of which there have been utilized factors of 16,765 deadweight tons and 14.5 knots speed, the world fleets amounted to 1,274.4 T2's.

Using this notional tanker as a base, world fleets have increased nominally by approximately 10 T2's and less than 1 per cent since the end of the war, but a substantial capacity increase of nearly 500 T2's and 64.3 per cent has occurred since September 1, 1939, just prior to World War II.

Although on net balance total world capacity has shown little change since September 1, 1945, there has been a considerable shift in the flag registry of these fleets. Vessels flying the American flag have reduced their capacity by more than 30 per cent since the end of the war, while ships under Panamanian registry show an increase of 229 per cent. Of the major foreign fleets, ships registered under the British Empire flags have increased their capacity by 41.7 per cent, with the Norwegian vessels

showing a 32.2 per cent larger capacity, and all other registries combined indicate an increase of nearly 25 per cent. The registry shift, therefore, has been effectuated by a severe reduction of the American flag, counterbalanced almost exactly by the magnitude of increase in foreign-flag ships. This condition is not surprising due to the fact that the United States was the largest single constructor and owner nation of tank ships during World War II.

Although this experience has occurred since the end of the war, there has been a different pattern of capacity ownership established in comparison with the prewar fleet distribution. Since September 1, 1939, tank ships flying the American flag have increased in capacity by approximately 183 per cent, or the equivalent of 339 T2's. Panamanian registered vessels, largely owned by American citizens, have expanded to a level more than three and one-half times their prewar capacity. Ships under the British Empire flags show a capacity 23.5 per cent greater, while Norway is the only major fleet owner which has not regained its prewar capacity. The Norwegian fleet currently shows a decline of 7.4 per cent, or the equivalent of slightly more than 11 T2's as compared to the prewar period. All other nations of the world have gained 16.8 per cent in their tank-ship carrying capacity.

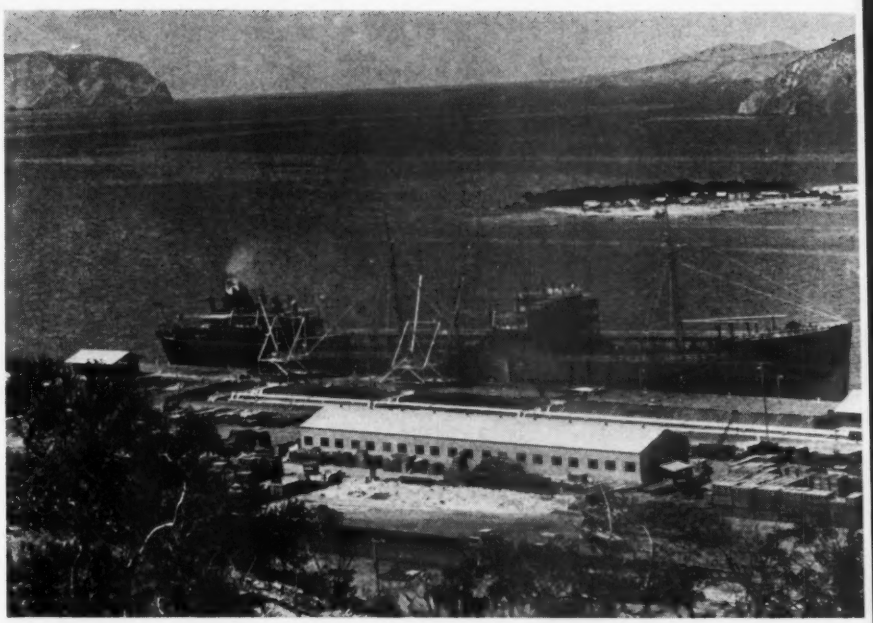
Positionally, there has been a considerable change in the proportions of world tankers registered under various flags. At present, the United States is first with slightly more than 41 per cent of the world tonnage, while the British Empire is second with about 21 per cent and Norway is third with 11 per cent of world capacity. At the beginning of the war, the United States was second to Great Britain and had only 23.9 per cent of the world's tanker capacity, while Britain had more than 28 per cent, Norway being third with 19.4 per cent. On balance, therefore, the United States flag has gained a positional increase of 72 per cent, while the British Empire shows a loss of 25 per cent in world fleet position, and the Norwegian flag has lost nearly one-half of the positional advantage it enjoyed prewar.

A further comparison of relative magnitudes of world fleets is indicated by the fact that at the end of the war, the United States fleet had nearly 60 per cent of the world capacity, while Great Britain had been reduced by war losses to 15 per cent, and Norway accounted for only 8.4 per cent of world capacity.

Size and Speed Distribution

In analyzing the present fleet for size and speed, it is found that the influence of T2's, with an average of 14.5 knots speed, far outweighs the total of the other three largest speed groups. For example, in the 14-knot group there are the equivalent of 548 T2's, while in the 10, 11, and 12-knot groups there are only 479 T2 equivalents. It is significant that 44.9 per cent of the present world capacity represents vessels under 14 knots, while 43 per cent of the total fleets is in the 14.0 to 14.9 speed group, and only 12.1 per cent is in the 15-knot-and-over category.

The influence of T2 construction also affects the size distribution of these vessels. In the 16,000-ton group alone there are represented approximately 560 T2 equivalents. This same comparison shows that 45.6 per cent of the present fleets are under 16,000 d.w. tons, 44.0 per cent in the 16,000 to 16,999-d.w.-ton group, and 10.4 per cent in the 17,000-d.w.-and-over classification.



Tanker Camp Namanu, capacity 130,000 bbl., of Socony-Vacuum Oil Co., Inc., loading crude at Puerto de la Cruz, bound for New York

Age Distribution

The need for meeting the military tanker needs during the war will probably have its severest impact upon the future construction pattern of tanker replacements for years to come. This problem is pointed out most clearly by an analysis of the age distribution of the present fleet.

In actual operation today, there are the equivalent of 99 T2's which are 26 years or more of age. This group con-

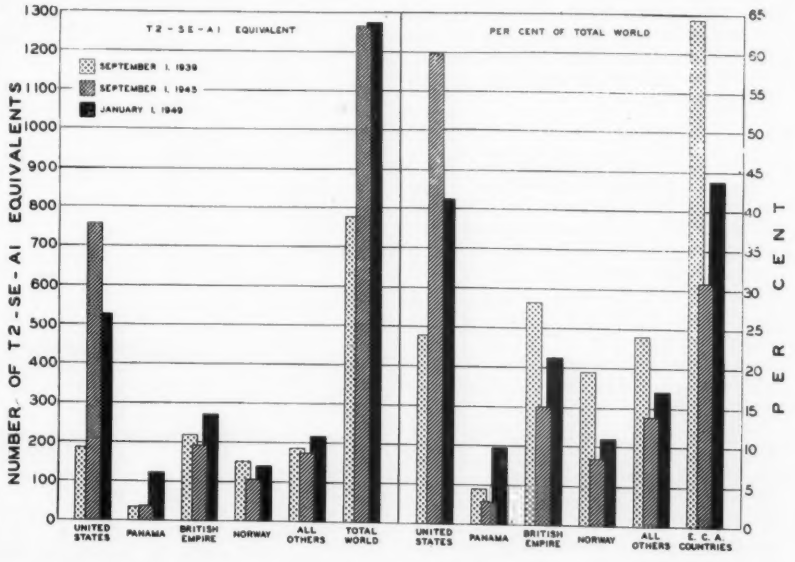


Fig. 1—World tank-ship fleets by major flags on selected dates. (Ocean-going vessels 2,000 gross tons and over)

Shallow-draft tanker Lei Ping loads finished oil products at Standard-Vacuum Petroleum Maatschappij's Soengei Geron refinery near Palembang for distribution to Stanvac marketing points in Indonesian area. Moesi River sand bars prevent large tankers from loading fully here

The Author

The author of this article has been associated with Sun Oil Co. since 1936 as statistical economist. He created and developed the company's present statistical research division. Born in New York City in 1904, Saurino graduated from New York University in mechanical engineering, and did graduate work in statistics and economics at Wharton Business School, University of Pennsylvania. He commenced his business career in 1926, and has served several companies as statistician. He is author of "World Tanker Fleets, 1900 to 1945," an original historical analysis of tank ships for every country, and has authored many articles on the economics of the petroleum industry and national economy.

tinues to reflect the impact of World War I when the War Shipping Board program was in effect. For example, these 99 T2 equivalents represent 250 actual vessels of which 195 were constructed during the war and postwar years of 1915 to 1922, inclusive, and the remaining 55 still in operation today were constructed prior to 1915. The oldest vessel has a construction date of 1892 and is, therefore, 56 years old.

While the economics of tanker operations depend not only upon the condition and age of a vessel, but also upon the going charter hire rates, it is evident that the age distribution of the present fleet must be considered for the long-range planning essential in efficient fleet operation. The present fleet as currently constituted, has 8.1 per cent of its capacity which is 26 years of age and over. Between 11 and 25 years, there is only 19.8 per cent, while under 10 years of age we have 72.1 per cent. Further, more than 42 per cent of the world capacity is under 5 years of age due to the World War II program.

Thinking in terms of a 20-year life for a tanker, it is obvious that the age distribution of an individual fleet would be most economically represented in terms of an even 5 per cent distribution per year. This would facilitate both replacement and expansion plans for individual fleets.

As against this hypothesis it should be pointed out that 16.4 per cent of the present capacity world-wide was constructed in the year 1943, 20.0 per cent in 1944, and 15.8 per cent in 1945. In total, more than half (52 per cent) of the present world capacity was constructed in those 3 years. World fleet owners are faced with a real problem in planning to equalize the age of their vessels to make up for this capacity 20 years hence, or in the years 1963-1965, inclusive.

The problem presented by age distribution distortions due to the impacts of both world wars should be faced by all major fleet owners on the basis of these incontrovertible facts. The United States tanker operators are affected to a greater degree than other tanker-fleet owners by this problem in that nearly 45 per cent of the American fleet is under 5 years of age, while 56 per cent of the Panamanian flag vessels are in this age

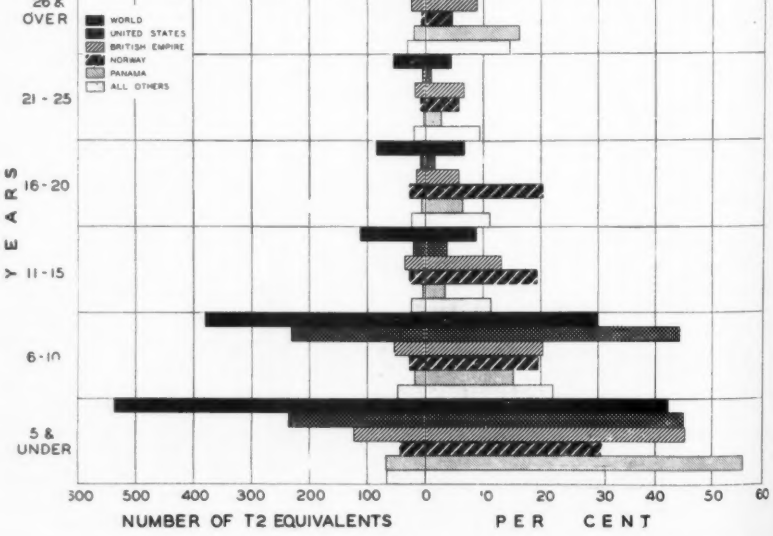


Fig. 2—Age distribution of world tank-ship fleets by 5-year age groups for major flags. January 1, 1949. (Ocean-going vessels 2,000 gross tons and over)

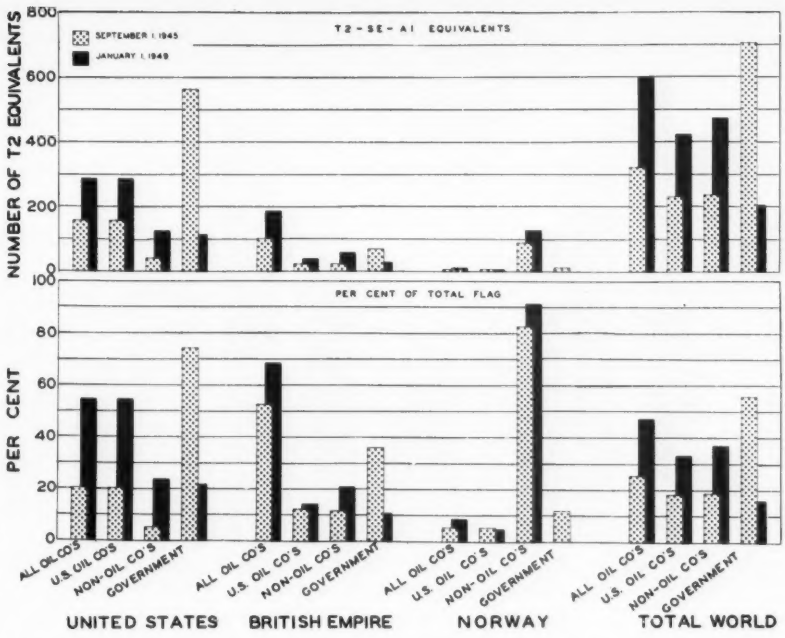


Fig. 3—Ownership of world tank-ship fleets, September 1, 1945, and January 1, 1949. (Ocean-going vessels 2,000 gross tons and over)

group. The nation least affected by a distorted age distribution is Norway which has nearly 93 per cent of its fleet 20 years of age and under and only 30 per cent of its present capacity in the under 5-years group.

Ownership

A growing importance is also attached to the world ownership distribution by broad groups. Less than half (47 per cent) of the present fleet is owned by oil companies throughout the world, while United States oil companies alone own about one-third of the present capacity. Nonoil companies worldwide account for nearly 37 per cent of the world fleet capacity and governments—mainly military—reflect an ownership of the remaining 16 per cent of the world's capacity.

Ownership distribution has changed

TABLE 1—WORLD TANK-SHIP FLEETS BY FLAG, ACTUAL AND T2-SE-A1 EQUIVALENTS AS OF JANUARY 1, 1949
Ocean-going vessels 2,000 gross tons and over. (Source: U. S. Maritime Commission)

Flag—	Actual				T2-SE-A1 equivalent		
	No.	Gross tons	D.W. tons	Ave. speed knots	No.	D.W. tons	As per cent of world
Western Hemisphere:							
United States	593	5,656,497	9,016,200	14.1	524.2	8,788,200	41.1
Government	117	1,151,533	1,816,900	15.2	113.5	1,902,800	8.9
U.S.M.C.	21	137,562	205,000	11.2	9.4	157,600	0.7
Military	96	1,013,971	1,611,900	15.7	104.1	1,745,200	8.2
Private	476	4,504,964	7,199,300	13.9	410.7	6,885,400	32.2
Oil companies	329	3,119,778	5,006,700	13.9	285.4	4,784,700	22.4
Nonoil companies	147	1,385,186	2,192,600	13.9	125.3	2,100,700	9.8
Panama	175	1,450,220	2,310,900	13.0	123.1	2,063,800	9.7
U. S. citizen	141	1,234,388	1,978,000	13.3	107.9	1,808,900	8.5
Canada	22	159,223	241,600	13.4	13.3	223,000	1.0
Others:							
Argentina	29	175,634	245,200	11.7	11.5	192,800	0.9
Brazil	5	30,077	44,000	10.2	1.8	30,200	0.2
Chile	2	7,586	9,600	11.0	0.4	6,700	0.0
Honduras	2	14,071	21,000	11.3	1.0	16,800	0.1
Mexico	13	81,080	129,800	10.5	5.6	93,900	0.4
Peru	1	2,820	4,300	10.0	0.2	3,300	0.0
Philippines	...	...	...	...	...	...	...
Uruguay	2	20,592	33,600	14.5	2.0	33,500	0.2
Venezuela	28	83,911	116,700	9.6	4.6	77,100	0.4
Sub-total	82	415,771	604,200	10.9	27.1	454,300	2.2
Total Western Hemisphere (including Canada and Philippines)	872	7,681,711	12,172,900	13.7	687.7	11,529,300	54.0
Europe:							
E.C.A. countries	938	7,354,762	11,026,300	12.3	557.1	9,339,800	43.7
Belgium	5	38,937	58,500	12.2	2.9	48,600	0.2
Denmark	15	129,038	201,100	11.8	9.8	164,300	0.8
France	51	455,199	698,500	13.0	37.3	625,400	2.9
Germany	1	5,897	9,200	9.0	0.3	5,000	0.0
Greece	11	94,077	149,100	13.5	8.3	139,200	0.6
Italy	62	481,057	745,400	12.7	39.1	655,500	3.1
Netherlands	91	475,889	665,600	11.5	31.4	526,400	2.5
Norway	208	1,804,481	2,742,000	12.4	139.7	2,342,100	11.0
Portugal	6	36,741	59,100	11.9	2.9	48,600	0.2
Sweden	36	329,944	506,200	13.5	28.1	471,100	2.2
Switzerland	2	11,571	17,900	10.3	0.8	13,400	0.1
Turkey	3	19,844	30,000	13.7	1.7	28,500	0.1
United Kingdom	447	3,472,087	5,143,700	12.0	254.8	4,271,700	20.0
Others:							
U.S.S.R.	19	116,632	175,900	10.9	7.9	132,400	0.6
Spain	21	128,979	176,600	11.4	8.3	139,200	0.7
Yugoslavia	1	6,074	9,400	11.5	0.4	6,700	0.0
Finland	5	38,632	59,000	10.6	2.6	43,600	0.2
Poland	1	6,487	9,300	10.5	0.4	6,700	0.0
Subtotal	47	296,804	430,200	11.1	19.6	328,600	1.5
Total Europe	985	7,651,566	11,456,500	12.2	576.7	9,668,400	45.2
Japan	7	60,485	85,900	13.3	4.7	78,800	0.4
China	5	41,089	61,500	12.3	3.1	52,000	0.2
Union of South Africa	2	21,130	33,600	14.5	2.0	33,500	0.2
India	1	3,391	5,400	8.0	0.2	3,300	0.0
Total world fleets	1,872	15,459,372	23,815,800	13.0	1,274.4	21,365,300	100.0
Total British Empire	472	3.655,831	5,424,300	12.1	270.3	4,531,500	21.2

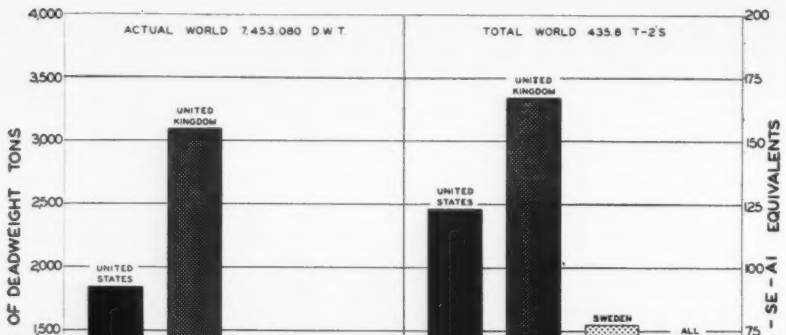


Fig. 4—World tank ships on order or under construction by country of construction. October 1948. (Ocean-going vessels 2,000 gross tons and over)

radically since the end of the war. On September 1, 1945, oil companies throughout the world owned 25.5 per cent of the total, while the United States oil companies accounted for 18.3 per cent of the world fleets. At that time, also, nonoil companies had a proportion of 18.8 per cent, while governments had more than half of the world capacity with 55.7 per cent.

Ownership shifts show a faster rate of tanker acquisitions by nonoil companies than for either all the oil companies or the United States group. For example, nonoil companies throughout the world nearly doubled their ownership since the end of the war, while oil companies increased their holdings by 86 per cent. During this time, the United States oil companies as a single group increased their capacity by 82.2 per cent on a world-wide basis.

Within the United States, specifically, the government suffered a reduction of 80 per cent in its holdings since the end of the war, while the United States nonoil group more than trebled their fleet with an increase of 213 per cent. United States oil companies increased their capacity by 84.6 per cent. On a T2 basis, the United States Government has released its ownership of 448 T2's, while nonoil companies have acquired 85 of these equivalent vessels and United States oil companies approximately 131 T2's.

This change has occurred more rapidly in the last 2 years than in the period from September 1, 1945, to January 1, 1947. Private owners in the United States as a group have more than doubled their fleet capacities since the end of the war with an increase of 111 per cent. Oil companies alone show an increase during this period of nearly 85 per cent, while nonoil companies have more than trebled their holdings. Of the total private United States fleet, oil companies now own nearly 70 per cent of the capacity with nonoil companies having the other 30 per cent.

Ranked on the basis of individual size, Standard Oil Co. (N.J.) has the largest fleet with 62 vessels equivalent to 58 T2's and 14.1 per cent of the total privately owned United States fleet. The second largest single fleet ownership is represented by Gulf Oil Corp. with 43 vessels equivalent to slightly more than 35 T2's and 8.6 per cent of total. Third in ranking is the National Bulk Carriers, with 25 vessels equivalent to nearly 29 T2's, because of greater average size and speed than the notional tanker, and represents 7.0 per cent of the total United States privately owned fleet.

Since the end of the war, there has emerged a large group of non-oil-company operators having for the most part one or a few vessels acquired under the Ship Sales Act. Their number at the present time is 65, although their ownership is also substantial in that the capacity of their vessels accounts for 23.5 per cent of the privately owned United States fleet.

Disposal Program

Virtual completion of the United States Government disposal program has been accomplished at this time. There now remains under United States Maritime Commission ownership only 17 actual ships in the reserve fleet and 4 other vessels that are being repaired for sale, of the total of 793 actual tankers constructed or acquired under the various "Merchant Marine Acts." Of the 793 vessels coming under the Maritime Commission's jurisdiction, 536 were designed T2's, either of the SE-AL or modified types. These 793 vessels also include the smaller T1 and larger T3 types of vessels in addition to privately designed ships.

In total, 492 vessels have been sold and delivered to private owners, of which 343 were to United States and 149 to foreign holders. The United States citizens group includes 81 vessels transferred to their accounts under Panamanian registry. In addition, 135 ships were returned to private owners of which 14 were for Panamanian registry. The military acquired 104 vessels with 66 of them

TABLE 3—T2-SE-A1 EQUIVALENT AGE DISTRIBUTION OF WORLD TANK-SHIP FLEET BY SELECTED AGE GROUPS AS OF JANUARY 1, 1949

Ocean-going vessels 2,000 gross tons and over. (Source: U. S. Maritime Commission)

Age groups in years:	World		United States		British Empire		Norway		Panama		All others	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
26 yr. and over	104.9	8.1	22.6	4.4	24.3	8.9	6.1	4.6	20.2	16.3	31.7	14.6
21 to 25	55.2	4.4	5.3	1.0	18.1	6.7	8.1	5.8	3.4	2.8	20.3	9.4
16 to 20	85.1	6.7	8.7	1.6	15.5	5.8	28.5	20.4	7.9	6.4	24.5	11.2
11 to 15	111.8	8.7	20.2	3.8	35.6	13.2	27.1	19.3	4.1	3.4	24.8	11.4
6 to 10	380.6	29.9	231.7	44.3	54.8	20.3	27.4	19.5	18.7	15.2	48.0	22.2
5 yr. and under	536.8	42.2	235.7	44.9	122.0	45.1	42.5	30.4	68.8	55.9	67.8	31.2
Total	1,274.4	100.0	524.2	100.0	270.3	100.0	139.7	100.0	123.1	100.0	217.1	100.0

TABLE 2—INVENTORY OF WORLD TANK-SHIP FLEETS EXPRESSED AS T2-SE-A1 EQUIVALENTS, FOR SELECTED DATES

Ocean-going vessels 2,000 gross tons and over (Source: U.S. Maritime Commission)

Ownership Flag	Date—Jan. 1, 1949		Sept. 1, 1945		Sept. 1, 1939		Change to Jan. 1, 1949, from:—Sept. 1, 1945		Sept. 1, 1939	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
United States	524.2	41.1	756.2	59.8	185.3	23.9	—232.0	—30.7	+338.9	+182.9
Panama	123.1	9.7	37.4	2.9	34.6	4.5	+85.7	+229.1	+88.5	+255.8
British Empire	270.3	21.2	190.8	15.1	218.9	28.2	+79.5	+41.7	+51.4	+23.5
Norway	139.7	11.0	105.7	8.4	150.9	19.4	+34.0	+32.2	—11.2	—7.4
All others	217.1	17.0	174.4	13.8	185.9	24.0	+42.7	+24.5	+31.2	+16.8
Total world	1,274.4	100.0	1,264.5	100.0	775.6	100.0	+9.9	+0.8	+498.8	+64.3
(E.C.A. countries)	557.1	43.7	390.5	30.9	498.4	64.3	+166.6	+42.7	+58.7	+11.8

being of the T2 design and 35 of the T3 type. Finally, it should be pointed out that the 17 vessels in the reserve fleet are composed of 3 T1 types, 2 private design, and 12 Liberty type vessels.

Utilization

In evaluating the adequacy of the United States fleet, it may be pertinent to appraise the utilization of these vessels. As of the end of September 1948, there were 471 actual vessels engaged solely in commercial operations under the American flag. Of this number, 59 were temporarily inactive for repairs and other reasons, while 17 represented the reserve fleet of laid-up vessels. The remaining 418 were engaged in various trades having a weighted average round-trip distance of 5,616 nautical miles. Of the total actual deadweight, 15.2 were plying in nearby foreign trade, 8.7 per cent in the overseas foreign service, and 13.9 per cent in the foreign to foreign-trade movements. The remaining 49.7 per cent were utilized in the domestic intercoastal service. A substantial increase in the "Foreign to Foreign" trade is accounted for primarily by the relatively large movement stemming from the Persian Gulf area. This movement accounted for 7 per cent of the total United States deadweight tonnage and 8 per cent of the deadweight tonnage in active service on that date. It was equal to approximately 16 per cent

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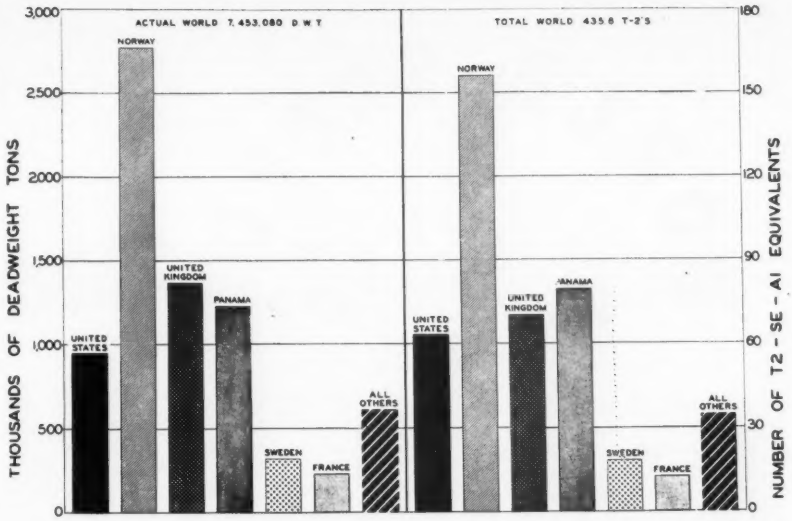


Fig. 5—World tank ships on order or under construction by country of registry, October 1948. (Ocean-going vessels 2,000 gross tons and over)

TABLE 4—ANALYSIS OF OWNERSHIP WITHIN FLAGS EXPRESSED AS T2-SE-A1 EQUIVALENTS AND PERCENTAGES OF WORLD TANK-SHIP CAPACITY AS OF JANUARY 1, 1949

Ocean-going vessels 2,000 gross tons and over. (Source: U. S. Maritime Commission)

Flag—	Tl. T2-SE-A1 Equiv.			All oil companies			U.S. oil companies			Nonoil companies			Governments		
	No.	D.W.T.	Cap. (%)	No.	D.W.T.	Cap. (%)	No.	D.W.T.	Cap. (%)	No.	D.W.T.	Cap. (%)	No.	D.W.T.	Cap (%)
Western Hemisphere:															
United States	524.2	8,788,200	100.0	285.4	4,784,700	54.5	285.4	4,784,700	54.5	125.3	2,100,700	23.9	113.5	1,902,800	21.6
Panama	123.1	2,063,800	100.0	76.6	1,284,200	62.2	76.6	1,284,200	62.2	46.5	779,600	37.8	....	.....	....
Canada	13.3	223,000	100.0	7.5	125,800	56.4	7.2	120,700	54.1	5.8	97,200	43.6	....	.....	....
Others:															
Argentina	11.5	192,800	100.0	0.3	5,000	2.6	....	.....	....	6.0	100,600	52.2	5.2	87,200	45.2
Brazil	1.8	30,200	100.0	....	.....	....	....	.....	....	1.5	25,100	83.3	0.3	5,100	16.7
Chile	0.4	6,700	100.0	....	.....	....	....	.....	....	....	.....	....	0.4	6,700	100.0
Honduras	1.0	16,800	100.0	....	.....	....	....	.....	....	1.0	16,800	100.0	....	.....	....
Mexico	5.6	93,900	100.0	....	.....	....	....	.....	....	....	.....	....	5.6	93,900	100.0
Peru	0.2	3,300	100.0	....	.....	....	....	.....	....	....	.....	....	0.2	3,300	100.0
Uruguay	2.0	33,500	100.0	....	.....	....	....	.....	....	....	.....	....	2.0	33,500	100.0
Venezuela	4.6	77,100	100.0	4.6	77,100	100.0	3.9	65,400	84.8	....	.....	....	....	.....	....
Suotctal	27.1	454,300	100.0	4.9	82,100	18.1	3.9	65,400	14.4	8.5	142,500	31.4	13.7	229,700	50.5
Total West. Hemis.*	687.7	11,529,300	100.0	374.4	6,276,800	54.5	373.1	6,255,000	54.3	186.1	3,120,000	27.0	127.2	2,132,500	18.5
Europe:															
E.C.A. countries	557.1	9,339,800	100.0	225.1	3,773,800	40.4	48.8	818,100	8.8	272.0	4,560,200	48.8	60.0	1,005,800	10.8
Belgium	2.9	48,600	100.0	2.1	35,200	72.4	2.1	35,200	72.4	0.8	13,400	27.6	....	.....	....
Denmark	9.8	164,300	100.0	2.8	46,900	28.6	2.8	46,900	28.6	7.0	117,400	71.4	....	.....	....
France	37.3	625,400	100.0	4.7	78,800	12.6	1.3	21,800	3.5	16.6	278,300	44.5	16.0	268,300	42.9
Germany	0.3	5,000	100.0	....	.....	....	....	.....	....	0.3	5,000	100.0	....	.....	....
Greece	8.3	139,200	100.0	....	.....	....	....	.....	....	8.0	134,200	96.4	0.3	5,000	3.6
Italy	39.1	655,500	100.0	1.3	21,800	3.3	1.3	21,800	3.3	24.4	409,100	62.4	13.4	224,600	34.3
Netherlands	31.4	526,400	100.0	25.0	419,100	79.6	3.7	62,000	11.8	6.4	107,300	20.4	....	.....	....
Norway	139.7	2,342,100	100.0	12.0	201,200	8.6	6.4	107,300	4.6	127.7	2,140,900	91.4	....	.....	....
Portugal	2.9	48,600	100.0	....	.....	....	....	.....	....	2.6	43,600	89.7	0.3	5,000	10.3
Sweden	28.1	471,000	100.0	....	.....	....	....	.....	....	28.1	471,100	100.0	....	.....	....
Switzerland	0.8	13,400	100.0	....	.....	....	....	.....	....	0.8	13,400	100.0	....	.....	....
Turkey	1.7	28,500	100.0	....	.....	....	....	.....	....	0.5	8,400	29.4	1.2	20,100	70.6
United Kingdom	254.8	4,271,700	100.0	177.2	2,970,800	69.5	31.2	523,100	12.2	48.8	818,100	19.2	28.8	482,800	11.3
U.S.S.R.	7.9	132,400	100.0	....	.....	....	....	.....	....	....	.....	....	7.9	132,400	100.0
Spain	8.3	139,200	100.0	....	.....	....	....	.....	....	....	.....	....	8.3	139,200	100.0
Yugoslavia	0.4	6,700	100.0	....	.....	....	....	.....	....	....	.....	....	0.4	6,700	100.0
Finland	2.6	43,600	100.0	....	.....	....	....	.....	....	2.6	43,600	100.0	....	.....	....
Poland	0.4	6,700	100.0	....	.....	....	....	.....	....	....	.....	....	0.4	6,700	100.0
Subtotal	19.6	328,600	100.0	....	.....	....	....	.....	....	2.6	43,600	13.3	17.0	285,000	86.7
Total Europe	576.7	9,668,400	100.0	225.1	3,773,800	39.0	48.8	818,100	8.8	274.6	4,603,700	47.6	77.0	1,290,900	13.4
Japan	4.7	78,800	100.0	....	.....	....	....	.....	....	4.7	78,800	100.0	....	.....	....
China	3.1	52,000	100.0	....	.....	....	....	.....	....	3.1	52,000	100.0	....	.....	....
Union of South Africa	2.0	33,500	100.0	....	.....	....	....	.....	....	2.0	33,500	100.0	....	.....	....
India	0.2	3,300	100.0	0.2	3,300	100.0	....	.....	....	....	.....	....	....	.....	....
Total world fleets	1,274.4	21,365,300	100.0	599.7	10,053,900	47.1	421.9	7,073,100	33.1	470.5	7,888,000	36.9	204.2	3,423,400	16.0
Total British Empire	270.3	4,531,500	100.0	184.9	3,099,900	68.4	38.4	643,800	14.2	56.6	948,800	20.9	28.8	482,800	10.7

*Including Canada and Philippines.

WORLD SUPPLY Picture Brightens

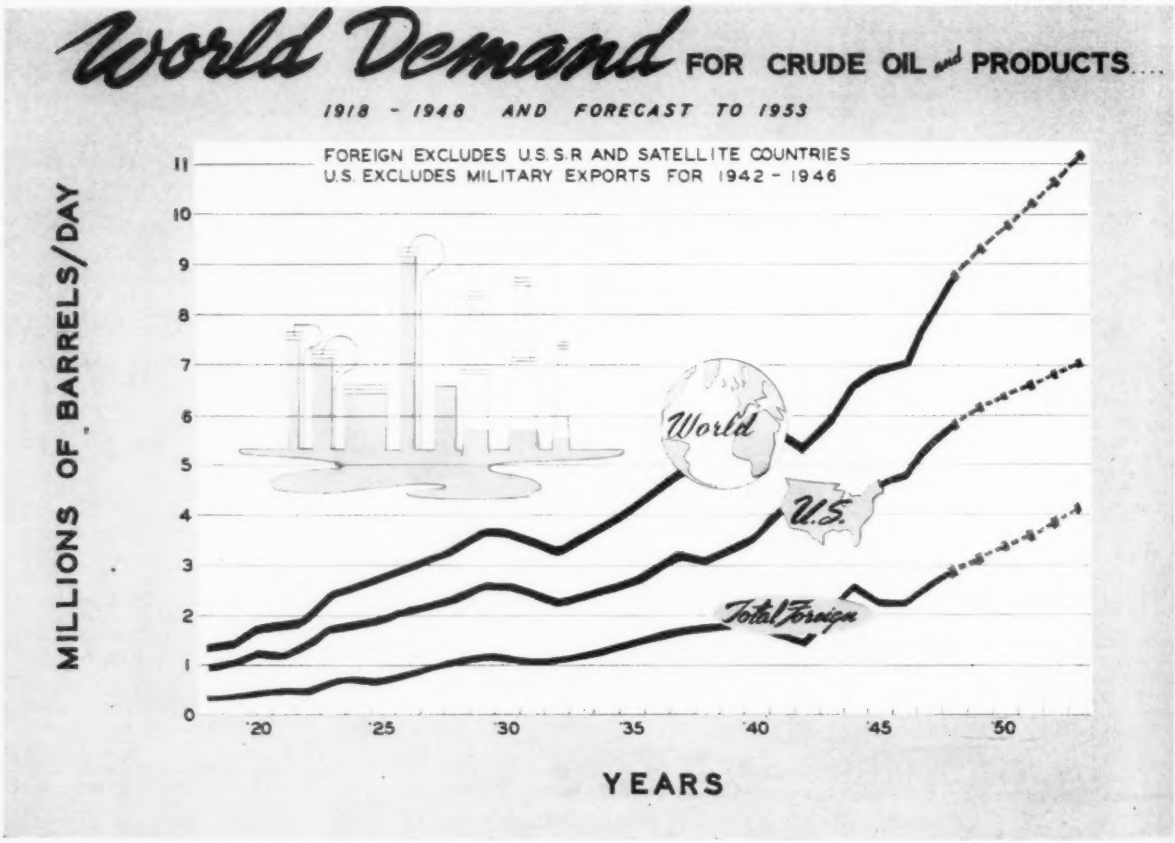
THE world oil-supply picture today has improved considerably as compared with the situation a year ago. This improvement was accomplished in spite of the fact that the industry did not get all the well casing, line pipe, tank cars, or refinery equipment that it wanted. The industry also was faced with rising costs and political uncertainties in many countries.

The supply problem, however, is not entirely solved and the industry cannot relax in its efforts to build up safe reserves. Industry must continue to advocate efficient consumption and the practice of consumers conservation of both heating oils and motor fuels. While the industry has not as yet built up adequate working stocks in all areas of the world, nor has it achieved the prewar position of a surplus crude production potential, it is the opinion generally that many of the bottlenecks of supply are now broken.

The petroleum industry not only has increased world capacities for crude production, refining, transporting, and storing but at the same time has met unprecedented postwar consumer demand both here and abroad. Normal replacements and expansion which were delayed during the war years had to be superimposed upon the increased facilities needed to care for the unexpected and unprecedented postwar oil needs. The task confronting the industry was looked upon as one that would require many years to complete and, therefore, the period of shortages or tight supply situation was expected to continue for a number of years. However, the present world supply-demand outlook indicates that we are now or will be shortly changing over from a period of shortages to a period of adequate supply, which was generally the prewar condition.

This more optimistic outlook is contingent to a large extent upon a greatly accelerated development of the Middle East.

A record of the past and the outlook for world demand reflect the postwar achievement and the tremendous tasks still confronting the petroleum industry. The data following show total world demand (including



by Arthur D. Stewart

But Problem Not Yet Solved Entirely

military) for crude and products from 1937 to 1948 inclusive and the outlook for the next 5 years:

WORLD DEMAND EXCLUDING U.S.S.R. AND SATELLITE COUNTRIES
(Thousands of barrels daily)

	Bbl. daily	Increase vs. previous year: Bbl. daily	Per cent
Prewar:			
1937	4,844	....	....
1938	4,886	42	1
1939	5,190	304	6
War years:			
1940	5,399	209	4
1941	5,648	249	5
1942	5,353	*295	*5
1943	5,912	559	10
1944	6,650	738	12
1945	6,940	290	4
Postwar:			
1946	7,146	206	3
1947	8,057	911	13
1948	8,822	765	9
1949	9,360	538	6
1950	9,831	471	5
1951	10,268	437	4
1952	10,721	453	4
1953	11,192	471	4

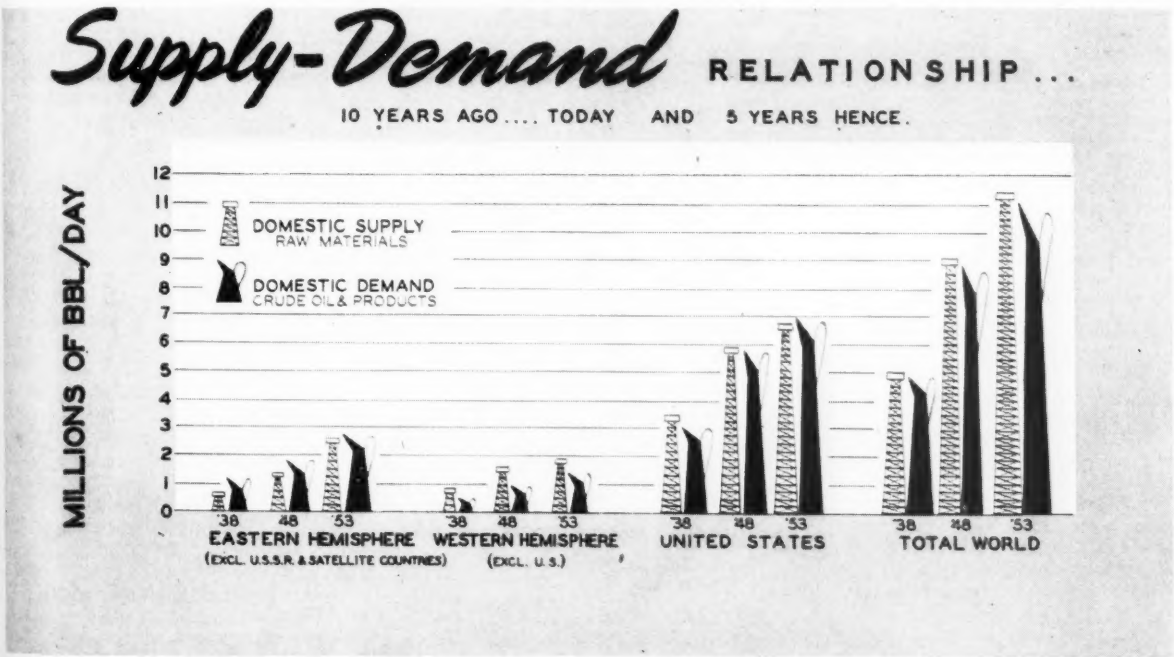
*Decrease.

It is to be noted from the foregoing data that world demand increased over 1½ million barrels per day during the war years from 5,400,000 bbl. per day in 1940 to over 6,900,000 bbl. per day in 1945. The greater part of this increase in demand was due to direct and indirect military requirements. Civilian consumption throughout the world was reduced largely to essential needs only. Therefore, it was expected that world demand at the termination of the war would probably return to a level nearer to the demand at the early part of the war, i.e., year 1941. However, as the record now shows the postwar world demand commenced at a level exceeding that at the end of war (year 1945).

Beginning the postwar period at the high level of 7,150,000 bbl. per day in 1946 world demand continued to rise in 1947 and 1948 with average annual increments exceeding those during the war years. The demand for 1948 is expected to reach 8,820,000 bbl. per day, an increase of 1,670,000 bbl. per day in only 2 years.

Arthur D. Stewart, economist of the foreign trade department of Socony-Vacuum Oil Co., Inc., is a graduate of Tufts College in mechanical engineering. Upon completing the foreign training course conducted by the Standard Oil Co. of New York, he was assigned in 1915 to the main office at Shanghai, China, where he held for several years the position of chief statistician. Transferred to the head office in New York, he continued in the capacity of a statistician to become manager of the foreign economics department and to the present position as economist of the foreign trade department.

During World War II, he was a member of several petroleum-industry statistical subcommittees which were formed to work on special problems with various departments of the U. S. Government.



These figures portraying world demand reflect the remarkable achievement of the industry. Despite shortages of materials and equipment required to expand production and transportation facilities together with other impeding factors, the industry is meeting currently growing consumer demand and it is also changing over from a period of shortages to one of adequate supply throughout the world generally.

However, the outlook for demand as presented in the foregoing tabulation indicates also that the industry has still before it the great task to provide even larger world supplies during the next 5 years. Although the percentages of increase "versus the previous year" are not expected to be as impressive as those of the last few years, the average quantitative increments per day are comparatively large exceeding 430,000 bbl. per day in each year. The expected growth in demand is impressive when it is realized that the industry may have to augment the 1948 daily rate of new supplies by 2,300,000 bbl. per day to meet the world's oil needs in 1953.

Situation in the United States

During 1948 there has been considerable expansion in transportation, storage, and distribution facilities in most areas throughout the United States. Therefore, the situation today regarding product inventories has improved greatly over that of a year ago so that the industry is now in a better position to meet the peak winter demand for heating oils, and the peak summer demand for motor fuel.

Both domestic production of raw material and domestic consumption reached peak levels during 1948, surpassing all previous years. Crude-oil production for 1948, very likely, will reach 5,500,000 bbl. per day as compared with 5,085,000 bbl. per day in 1947, an increase of 415,000 bbl. per day or 8 per cent. Production of natural gasoline and benzol will average 400,000 bbl. per day as compared with 364,000 bbl. per day in 1947, an increase of 36,000 bbl. per day or 10 per cent. Domestic demand for crude and products will reach a high level of about 5,900,000 bbl. per day as compared with 5,449,000 bbl. per day for 1947, an increase of 451,000 bbl. per day or 8 per cent.

Whereas a year ago published outlooks indicated generally declining production of crude in the United States, it is now foreseen that increasing production will continue over the next 5 years by an annual increment of about 150,000 bbl. per day. The supply of natural gas and benzol is expected to rise from 400,000 bbl. per day in 1948 to 540,000 bbl. per day in 1953.

Total exports of crude and products from the United States for 1948 will average probably about 384,000 bbl. per day as compared with 451,000 bbl. per day for 1947, a decline of 17 per cent. Continued downward trend in exports is foreseen over the next 5 years, declining to 191,000 bbl. per day in 1953. Government control of exports from the United States is expected to continue but quotas probably will be modified to conform with current supply-demand situation of each product. Export quotas will depend to a large extent upon the aid program of the Economic Cooperation Administration.

Continued upward trend is expected in domestic demand for crude and products, reaching a level of over 7,000,000 bbl. per day in 1953 as compared with 5,900,000 bbl. per day in 1948. The graphical chart showing world demand illustrates the large volumetric changes and the higher upward trend in United States domestic demand during the present postwar era as compared with prewar.

The United States has passed for the first time since a few years in the twenties from a net exporter to a net importer in order to close the gap between available domestic supplies and total requirements. It is expected that increasingly larger imports will be needed but not at a very rapid annual rate of increase. To balance requirements, imports of only 526,000 bbl. per day is foreseen for 1953 as compared with the average 1948 rate of 474,000 bbl. per day. During the past few years most of the published forecasts stated that the United States would have to import about 1,000,000 bbl. per day in the near future to close the gap between domestic supplies and requirements. Notwithstanding the substantial rise in demand, however, it is now apparent that required imports are not expected to rise so rapidly. In view of the more optimistic outlook regarding indigenous raw materials, required imports of 1,000,000 bbl. per day may not be necessary for many years.

According to published reports on

(Continued on page 192)

TABLE 1—WORLD SUPPLY—CRUDE OIL AND ALLIED PRODUCTS PRODUCTION
(Excluding Russia and Satellite Countries)
(Thousands of barrels daily)

Areas—	1938		1946		1947		1948*		
	Bbl.	Per cent of total world	Bbl.	Per cent of total world	Bbl.	Per cent of total world	Bbl.	Per cent of total world	% Inc. vs. 1947
Crude:									
United States	3,327	70	4,751	68	5,085	66	5,500	64	8
Caribbean	623	13	1,181	17	1,316	17	1,415	16	8
Other Western Hemisphere	222	5	255	4	274	4	304	4	11
Total Western Hemisphere	4,172	88	6,187	89	6,675	87	7,219	84	8
Marshall plan—Europe	13	0	32	0	33	1	44	1	33
Near and Middle East	326	7	695	10	833	11	1,120	13	34
Other Eastern Hemisphere	215	5	49	1	98	1	194	2	98
Total Eastern Hemisphere	554	12	776	11	964	13	1,358	16	41
Total foreign	1,399	30	2,212	32	2,554	34	3,077	36	20
Total world—crude	4,726	100	6,963	100	7,639	100	8,577	100	12
Natural gasoline, benzol, etc.:									
United States	146	54	322	84	364	89	400	89	10
Foreign	124	46	61	16	47	11	50	11	6
Total world allied prod.	270	100	383	100	411	100	450	100	10
Total world supply	4,996	...	7,346	...	8,050	...	9,027	...	12
TOTAL WORLD SUPPLY OF RAW MATERIALS									
United States	3,473	70	5,073	69	5,449	68	5,900	65	8
Foreign	1,523	30	2,273	31	2,601	32	3,127	35	20
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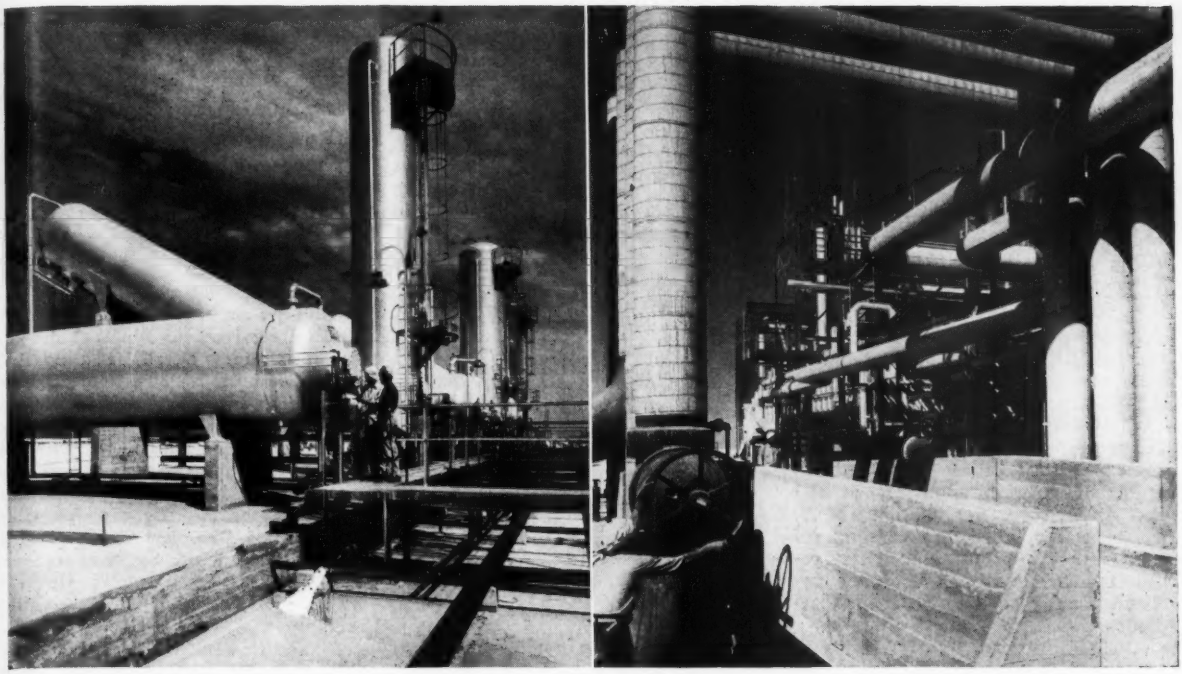

Treating plant (left) and power house (right) at the Ras Tanura, Saudi Arabia, refinery of Arabian American Oil Co.

REFINING Saudi Arabia CRUDES

by Gustav Egloff

THE growth of the petroleum industry in Saudi Arabia makes a true story for the "Arabian Nights." The first wildcat well was completed in 1935 but the first well producing commercial quantities of oil was completed in 1938. Since that time the daily production of crude oil from Ibn Saud's desert kingdom has increased to the stupendous volume of about 500,000 bbl. Current production in Dammam, Abqaiq, and Qatif fields comes from 63 wells which average about 8,000 bbl. a day each. The explored areas are in the early stages of development and no one can say what the ultimate production will be. There is every indication that present production is but a small per cent of potential. Estimated reserves are now 5 billion barrels but it is more likely that they will far exceed this figure.

At present Saudi Arabia is fifth among all producing countries and it is probable that it will soon be the third largest exporter of petroleum and its products. Current production is refined in part at Ras Tanura where approximately 130,000 bbl. a day are processed and at Bahrein Petroleum Co.'s refinery on Bahrein Island, which has a capacity of approximately 160,000 bbl. a day.

Saudi Arabia developments have been brought about by Arabian American Oil Co., which holds a concession of about 440,000 sq. miles. This company plans to invest 350 million dollars on oil-field development, refinery construction, and pipe-line facilities in the next 2 or 3 years.

Crude-Oil Characteristics

Crude oils from Saudi Arabian fields are predominantly paraffinic and resemble East Texas crudes both in respect to boiling range and yields of products. They are generally classified as high-sulfur crudes, but they are not considered sour because they do not contain highly active sulfur compounds. The stability and relative inactivity of the sulfur compounds permit the employment of normal operating procedures and utilization of conventional distillation, cracking, and treating processes. The crude oils contain such small amounts of naphthenic acids that corrosion from this source is negligible in processing and product consumption. The neutralization number of Arabian crudes is low and averages about 0.3 mg. of KOH per gram of crude.

TABLE 1—ABQAIQ CRUDE

Composition—	Vol. %	Overhead‡
Propane (C_3H_8)	0.1	0.5
Isobutane (i-C_4H_{10})	0.2	2.4
n-Butane (n-C_4H_{10})	2.0	16.9
Isopentane (i-C_5H_{12})	1.1	...
		Botts. C_5+
n-Pentane (n-C_5H_{12})	2.2	80.2
C_6 plus (over 46° C.)	†94.4	...
Total	100.0	100.0

*U. O. P. Co. data. †Specific gravity C_6+ = 0.8493; 35.1° A.P.I. ‡From debutanization of 0.3-10.2 per cent light gasoline.

Shipments of Saudi Arabian crude at present consist of oils from Dammam, Abqaiq, and Qatif fields. Since all three have substantially the same general character, there is no need for segregation. While the composition of the crude shipped in tankers may vary somewhat, present shipments average about two-thirds Abqaiq, one-third Dammam, and small amounts of Qatif crude. As shipped, the crude blends are very low in salt content and b.s. and w.

Table 1 shows the hydrocarbon analysis of a typical Abqaiq crude* and the overhead from the debu-

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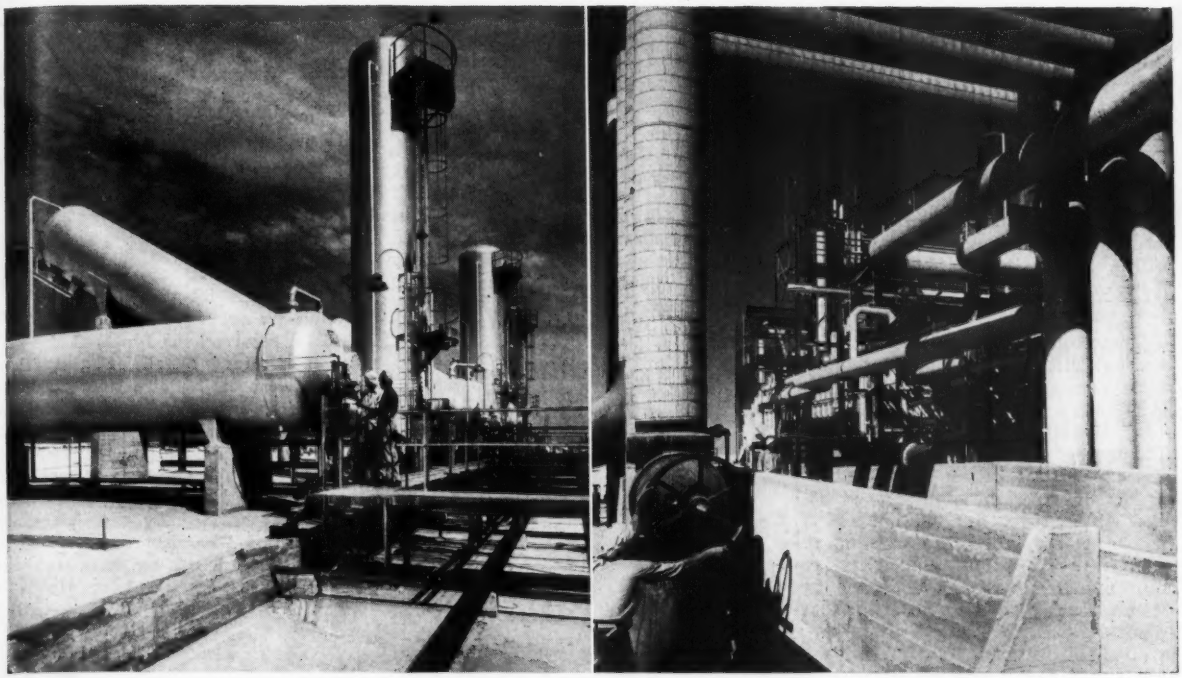

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Table 1 shows the hydrocarbon analysis of a typical Abqaiq crude* and the overhead from the debu-

*Universal Oil Products Co. data.

tanization of the light gasoline distilled from it. Table 2 shows the breakup of this crude oil by Hempel laboratory distillation and the properties of each fraction, including its 100-ml. distillation.* Table 3 gives a hydrocarbon analysis of Dammam crude* and Table 4 shows its Hempel fractionation and the properties of the fractions obtained.* Both crudes are highly paraffinic as shown by the A.P.I. gravity of the light gasolines with end boiling points varying from 215° to 251° F.

These light gasolines have good lead susceptibilities even though their octane ratings are around 60 by the A.S.T.M. motor method. The naphthas boiling from 175° to 365° F. in the case of the Abqaiq crude and 254° to 415° F. from the Dammam crude show octane numbers of 36.7 and 32.9 respectively. The I.P.T. smoke points of 24 and 22 mm. respectively are below commercial requirements but such distillates respond readily to sulfuric acid treatment as will be shown in a later section. Sulfur in both crude oils exhibit a tendency to concentrate in the bottoms from the fractionation while total sulfur in the light gasolines is 0.05 per cent or lower.

Two breakups of Arabian crudes which are refined at the Ras Tanura refinery of Arabian American Oil Co. and the Bahrein refinery of Bahrein Petroleum Co., Ltd., are shown in Table 5. The product yields vary with the type of kerosine produced. The highly paraffinic nature of the crude oil is shown by the properties of all the products. The 5 per cent of light debutanized gasoline produced in both cases has an initial boiling point of 100° F. and a final boiling point of 230° F. For an A.P.I. gravity of 80° with practically standard 10 lb. R.v.p., the A.S.T.M. motor method clear octane number is only 62, though 3 cc. of tetraethyl lead increased it to 78.5.

The naphthas indicated in the table as heavy gasoline (59.4 and 58.9 A.P.I.

TABLE 3—DAMMAM CRUDE*

Composition—	Vol. %
Propane (C_3H_8)	Trace
Isobutane (i-C_4H_{10})	0.04
n-Butane (n-C_4H_{10})	0.70
Isopentane (i-C_5H_{12})	0.72
n-Pentane (n-C_5H_{12})	1.14
C_6 plus (over 46° C.)	†97.40
Total	100.00

*U. O. P. Co. data. †Specific gravity C_6+ = 0.8550; 34.0° A.P.I.

The Author

© Fabian Bachrach

The author, Universal Oil Products Co., is one of the industry's most widely known technologists. He received his A.B. degree at Cornell in 1912, and his M.A. at Columbia the following year. In 1915 he received his Ph.D. at the latter institution. Noted as a speaker and a lecturer, he also holds patents numbering into the hundreds in petroleum, oil shale, and chemical processing. He has been awarded honorary degrees by two technical institutions, and was awarded the medal for service by the American Institute of Chemists and named a "Modern Pioneer" by the National Manufacturers Association. He is a member of a score of major scientific societies.

In addition to this article on refining Saudi Arabian crudes, he is the author of another article in this issue, describing the refining of Latin American crudes on page 263.

TABLE 2—ABQAIQ CRUDE OIL—HEMPEL FRACTIONATION, AND PROPERTIES OF FRACTIONS

Fraction—	Crude oil	Unstab. gaso.	Debut. gaso.	Naph.	Kero.	Topped crude after— Unstab. gaso.	Naph.	Kero.	Water	Dist. loss
Yield, volume per cent of:										
Crude as received	99.8	....	....	....	....	....	....	....	0.2	..
Position in crude	....	0.3-10.2	....	....	....	10.2	.....	....	0.2	0.1
	....	0.3-10.2	....	10.2-30.2	....	100.0	30.2	....	0.2	0.1
	....	0.3-10.2	....	....	30.2-38.2	....	100.0	38.2	....	0.1
	....	....	†7.9	....	....	....	....	100.0	....	....
Analyses of fractions:										
Gravity, °A.P.I. at 60° F.	37.6	86.2	80.3	58.9	47.6	33.9	28.1	25.8	....	....
Spec. gravity at 60° F.	0.8368	0.6500	0.6681	0.7432	0.7901	0.8555	0.8866	0.8996	....	....
Total sulfur, per cent	1.41	....	0.03	0.05	0.10	1.48	1.82	1.98	....	....
Mercaptan sulfur, per cent	....	....	0.003	0.010	0.016	....	....	....	....	....
Hydogen sulfide, per cent	....	....	....	0.002	0.007	....	....	....	....	....
Reid vapor pressure, lb.	3.5	20.8	9.0	....	....	....	....	....	....	....
Octane No.:										
Motor method clear	....	....	62.8	36.7	....	....	....	....	....	....
Motor method +3 ml. TEL/U.S. gal.	....	....	81.5	60.4	....	....	....	....	....	....
Cold test, °F.	—5	....	....	....	....	—5	5	10	....	....
B.s. and w., per cent	0.3	....	....	....	....	0.1	0.2	0.2	....	....
I.P.T. smoke point, mm.	....	....	....	....	24.0	....	....	....	....	....
Viscosities:										
Kinematic at 100° F., cst.	3.75	....	....	....	1.17	5.50	14.83	24.15	....	....
Kinematic at 210° F., cst.	....	....	....	....	....	1.90	3.44	4.62	....	....
Universal at 100° F., sec.	38.4	....	....	....	27.7	43.9	77.1	115.3	....	....
Universal at 210° F., sec.	....	....	....	....	....	32.2	37.7	41.4	....	....
Salt as sodium chloride, lb./M. bbl.										
100 ml. distillation:									Vac.	
I.b.p., °F.	130	76	104	174	353	240	390	470	471	....
5 per cent	180	82	119	209	361	280	423	492	509	....
10 per cent	230	87	123	221	364	315	442	510	540	....
20 per cent	314	95	127	235	368	380	495	549	595	....
30 per cent	388	105	131	247	372	437	552	593	647	....
40 per cent	468	115	136	259	376	508	614	641	698	....
50 per cent	554	126	144	271	381	580	666	675	748	....
60 per cent	638	140	154	283	387	658	700	697	804	....
70 per cent	710	154	167	296	393	707	721	714	860	....
80 per cent	740	172	181	311	402	734	738	730	922	....
90 per cent	760	200	199	332	417	748	752	746	....	....
95 per cent	760	215	210	345	430	754	760	....	....	....
End point, °F.	760+	215	225	365	449	754	760	760+	962	....
Per cent recovery	97.0	95.0	98.0	99.0	98.5	97.0	96.0	96.0	87.0	....
Per cent bottoms	....	1.0	1.1	1.0	1.5	....	....	....	12.9	....
Per cent loss	....	4.0	0.9	....	....	....	....	....	....	....
Per cent coke by weight	2.8	....	....	....	....	3.3	4.1	4.5	....	....
Per cent recovery at 400° F.	32.1—	....	....	....	....	....	....	....	....	....
Per cent recovery at 572° F.	52.0+	....	....	....	....	....	....	....	....	....

*U. O. P. Co. data. †Debutanized gasoline represents 7.9 per cent of total crude.

gravity) have initial boiling points of around 200° F. and final boiling points of around 350° F., but their octane numbers clear are only 34 and 34.5 respectively. These naphthas, however, are thermally reformed to increase their octane number and then blended with the light gasoline, after which tetraethyl lead is added to obtain a product of required octane number. The kerosine distillates contain approximately 20 per cent aromatics and can be treated to produce marketable products by lead sulfide sweetening, sulfuric acid treatment, or solvent extraction.

Both the diesel fuels have 60 ce-

(Continued on page 202)

TABLE 4—DAMMAM CRUDE OIL—HEMPEL FRACTIONATION, AND PROPERTIES OF FRACTIONS*

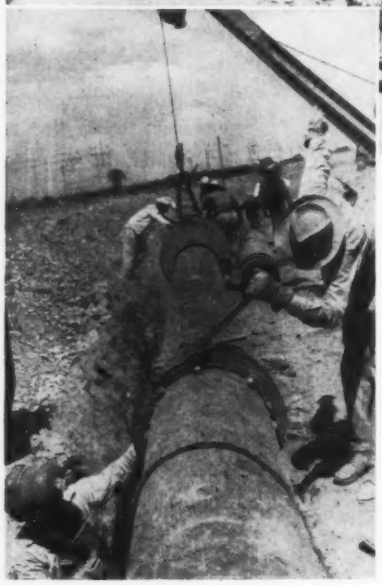
Fraction—	Crude oil	Light gaso.	Naphtha	Kerosine	Topped crude after Light gaso.	Topped crude after Naphtha	Topped crude after Kerosine	Dist. loss
Yield, volume per cent of:								
Crude as received	100.00	....	....	....	....	....	....	....
Position in crude	....	0.1-10.0	....	....	10.0—	....	....	0.1
	....	0.1-10.0	10.0-30.0	....	100.0	30.0—	....	0.1
	....	0.1-10.0	10.0-30.0	30.0—	....	100.0	38.0—	0.1
	....	....	....	38.0	....	....	100.0	....
Analyses of fractions:								
Gravity, °A.P.I. at 60° F.	35.0	74.4	51.9	45.1	31.6	26.9	24.7	....
Spec. gravity at 60° F.	0.8498	0.6872	0.7715	0.8012	0.8676	0.8933	0.9059	....
Total sulfur, per cent	1.57	0.05	0.06	0.13	1.62	2.07	2.23	....
Mercaptan sulfur, per cent	....	0.012	0.012	0.014	....	....	....	....
Hydrogen sulfide, per cent	....	....	0.004	0.016	....	....	....	....
Reid vapor pressure, lb.	1.3	11.0	....	....	....	....	....	....
Octane No.:								
Motor method clear	....	59.3	32.9	....	....	....	....	....
Motor method +3 ml. TEL/U.S. gal.	....	78.3	55.2	....	....	....	....	....
Cold test, °F.	5	....	....	....	5	10	15	....
B.s. and w., per cent	0.2	....	....	....	0.2	0.2	0.2	....
I.P.T. smoke point, mm.	....	....	....	22.0	....	....	....	....
Viscosities:								
Kinematic at 100° F., cst.	4.53	....	....	1.47	7.22	17.65	28.94	....
Kinematic at 210° F., cst.	....	....	....	....	2.23	3.99	5.18	....
Universal at 100° F., sec.	40.8	....	....	29.8	49.4	87.8	136.3	....
Universal at 210° F., sec.	....	....	....	....	33.4	39.3	43.2	....
Salt as sodium chloride, lb./M. bbl.	None	....	....	....	....	....	....	....
100 ml. distillation:								Vac.
I.b.p., °F.	149	102	254	380	290	433	498	492
5 per cent	220	120	268	392	321	459	517	530
10 per cent	267	127	275	396	355	478	534	556
20 per cent	344	139	283	402	400	523	568	606
30 per cent	414	149	292	406	457	569	605	654
40 per cent	489	160	302	411	525	623	646	703
50 per cent	572	169	312	416	596	667	676	755
60 per cent	643	179	323	422	660	691	694	806
70 per cent	700	189	335	428	706	705	707	865
80 per cent	740	201	350	437	732	720	721	930
90 per cent	760+	216	373	451	748	737	738	...
95 per cent	...	234	388	468	...	745	749	...
End point, °F.	...	251	415	488	748	745	749	987
Per cent recovery	96.0	97.5	99.0	98.5	96.0	95.5	95.0	87.5
Per cent bottoms	....	1.1	1.0	1.5	....	....	....	12.4
Per cent loss	....	1.4	....	....	....	....	....	....
Per cent coke by weight	3.5	....	....	....	3.9	4.6	5.3	....
Per cent recovery at 400° F.	28.0	....	....	....	....	....	....	....
Per cent recovery at 572° F.	50.0	....	....	....	....	....	....	....

*U. O. P. Co. data.

TABLE 5—CRUDE BREAKUP

	Crude	C_4 and lighter	Lt. gaso. (debutanized)	Max. kerosine by lead sulfide treating: Hy. gaso.	Max. kerosine by lead sulfide treating: Kerosine	Max. kerosine by lead sulfide treating: Diesel	Max. kerosine by solvent treating: Hy. gaso.	Max. kerosine by solvent treating: Kerosine	Max. kerosine by solvent treating: Diesel	Bottoms
Yield from crude, per cent	100.0	1.50	5.1	17.1	16.1	23.2	....	....	....	36.9
Yield from crude, per cent	100.0	1.50	5.1	....	....	....	15.9	18.6	22.0	36.9
Gravity, °A.P.I.	36.0	....	80	59.4	47.3	35.9	58.9	46.2	34.2	18.9
R.v.p., lb.	2.3	....	9.4	1.0	....	....	1.0	....	....	....
H_2S content	None	....	....	....	....	....	....	....	....	....
Per cent sulfur (total)	1.4	....	0.05	0.028	0.106	1.17	0.03	0.17	1.23	2.74
Per cent R.S.H.	....	....	0.035	0.018	0.023	....	0.02	0.024	....	....
Salt content, lb./M. bbl.	8	....	....	....	....	....	....	....	....	....
Distillation: T.b.p.										
I.b.p., ° F. 104	(4%)	....	100	200	333	419	211	332	436	....
10 per cent 189	....	....	108	217	358	495	228	366	513	....
20 per cent 284	....	....	114	226	368	516	236	376	537	....
50 per cent 374	....	....	144	251	394	559	257	409	582	....
70 per cent 743	....	....	168	272	416	587	275	438	614	....
90 per cent 842	(80%)	....	208	297	448	631	300	478	659	....
End point ...	....	....	230	347	483	668	340	507	694	....
Per cent isobutane	0.57	0.38	....	....	....	....	....	....	....	....
Per cent n-butane	0.93	0.62	....	....	....	....	....	....	....	....
Pour point, °F.	—15	....	....	....	....	+15	....	....	+20	+60
Per cent aromatics	....	....	....	....	*20	....	....	±20	....	....
Cetane number, A.S.T.M.	....	....	....	....	....	60	....	....	60	....
Octane, A.S.T.M. motor method, clear	....	....	62	34	....	....	34.5	....	....	....
+3 cc. TEL	....	....	78.5	58	....	....	58.5	....	....	....

*Approximate.



Above: Stovepiping 93-ft. joints of 30-in. pipe for a "restrained" section supported on piles laid for Trans-Arabian Pipe Line Co. by Bechtel Corp. The gate valves in the background weigh 22,000 lb. each. Left: Lining up preparatory to welding stringer bead in the laying of 20-in. pipe for 150-mile natural-gas line being laid by Williams Brothers Co. for Petroleos Mexicanos from Poza Rica to Mexico City

Crude-Oil Lines Predominate In Foreign Building Program

by Paul Reed

THE pipe-line-construction programs outside the United States, comprising more than 12,000 miles, represent nearly a quarter of world pipe-line programs amounting to a total of 50,000 miles including 1948 projects and those planned for the future.

Crude-oil pipe-line construction predominates. Such projects completed in 1948 comprise 400 miles, projects under construction 2,700 miles, and projects planned for the future 4,000 miles.

Natural-gas activities abroad are indicated by projects comprising about 1,780 miles for this service completed this year and currently under construction; 2,100 miles are planned for the future.

The building of approximately 1,020 miles of products lines now under construction and planned for the future in foreign countries will be a substantial start toward the development of world-wide systems for economical transportation to distribution points.

In world pipe-line building certain crude-oil projects are outstanding for their utilization of large-diameter pipe and for the application of pipe lines to supplant water-borne shipping.

Large Diameters Used

Creole Petroleum Corp.'s 155-mile, 24-26-in. line being put in operation this month between Ule tank farm on Lake Maracaibo and Amuay Bay on Paraguana Peninsula, is the largest-diameter line in crude-oil service in the world. Until the construction of this significant project all shipments from the Lake Maracaibo area went by water. Building of this line is described in an article on page 176, September 23, 1948, issue of The Oil and Gas Journal.

Nowhere in the world are crude-oil lines of such large diameter and length being planned for crude-oil transportation as the four great systems which will be built in the Middle East in the next few years in the following order: (1) Trans-Arabian Pipe Line Co., 30-31-in.; (2) Middle East Pipe Line Co., 34-36-in.; (3) Kuwait Oil Co., 30-in.; (4) Iraq Petroleum Co., Ltd., 30-32-in.

While the detailed programs for some of these lines have not been announced it is pointed out that the lines connecting the Persian Gulf and northern Iraq production to the Eastern Mediterranean will have an initial capacity around 1,500,000 bbl. The potential capacity through the installation of additional pumping facilities and looping is much greater. The exact completion dates of these Middle East lines is dependent on the delivery of pipe and conditions having to do with operations within the countries which will be traversed by the lines.

The substantial economic advantages of a pipe line over tanker transportation, which are determining plans for the 1,070-mile, 30-31-in. Saudi Arabia-Lebanon crude-oil line, have been discussed by B. E. Hull, president of Trans-Arabian, in an

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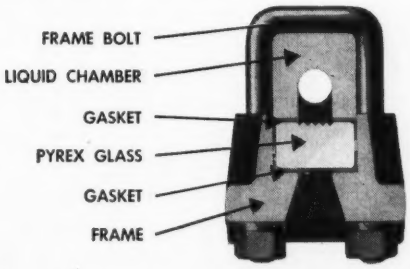

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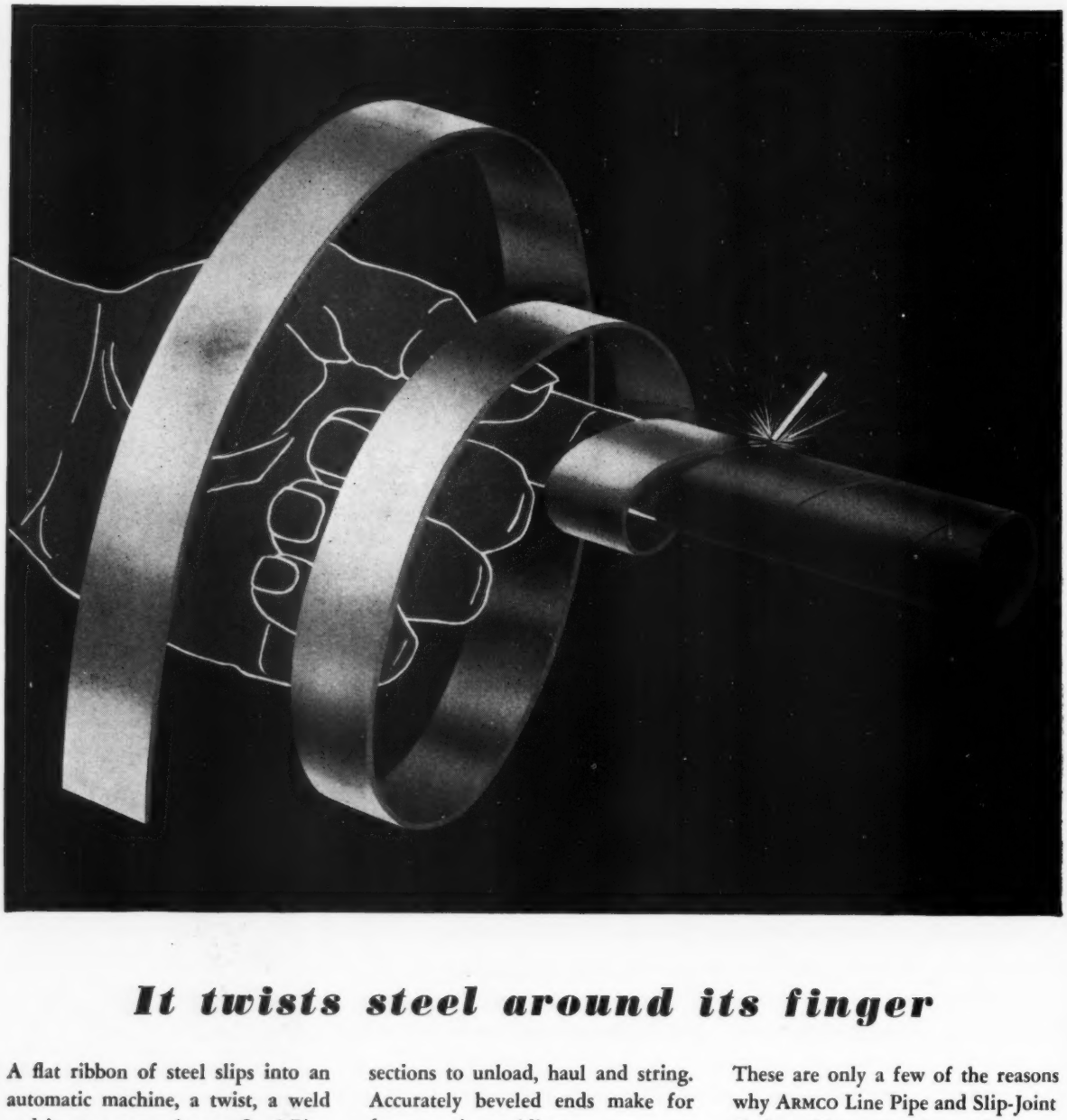

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EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

ARMCO STEEL PIPE

article on page 176, September 23, 1948, issue of The Oil and Gas Journal.

Products pipe lines currently planned and built are scattered over the world in South America, Europe, and Africa. In Colombia a products line laid last year up the Magdalena River may be extended in several directions by various interests. Africa's first commercial pipe line, 150 miles long, is being laid to move products into the interior of Tanganyika on the East Coast. Extensive plans are reported to be discussed for a network of products lines to serve Europe. While the proposals for the Le Havre-Paris line have been under consideration for more than a year, there have been no announcements to indicate when the project may materialize.

Likewise, natural-gas-line activity is widespread. Conspicuous among these is the 1,100-mile, 10-in. line being laid by Direccion General del Gas de Estado from Comodoro Rivadavia to Buenos Aires. This is the longest gas line ever undertaken outside the United States. When completed it will be the longest pipe line of any kind in South America.

In France the natural-gas system of Regie Autonome des Petroles is being extended from Toulouse to Bordeaux; the Toulouse Agen section has been completed this year. Efforts are being made in Italy for arrangements which would lead to providing facilities for the transmission of gas from the large reserves of the Po Valley to the northern industrial area of the country.

The most extensive planning for future pipe lines outside the United States appears to be for the transmission of gas in Canada and Mexico.

The Mexican Government, together with two gas companies, has been considering a 600-mile line from the Tamaulipas area to Mexico City. This year Petroleos Mexicanos is building a line from Poza Rica to Mexico City scheduled for completion in the first quarter of 1949. There is also some discussion in Mexico of future possibilities of exporting gas from Mexico to the United States.

Planning has been done in Canada by several organizations aiming at transmitting gas from Alberta fields as far east as Winnipeg and as far west as Vancouver. The line discussed for Vancouver would go via United States territory where it would serve Seattle, Wash., and Portland, Ore.

TABLE 1—FOREIGN CRUDE-OIL PROJECTS
1948-1955 (announced)

Company—	Miles	Diam. (in.)	Status	Location
Anglo-Iranian Oil Co., Ltd.	56	20-22	Under way	Agha Jari-Mashur, Iran
Cia. de Petroleo Shell de Colombia	48	6	Completed	El Dificil field—Plato station of Andian Pipe Line, Colombia
Creole Petroleum Corp.	155	24-26	Completed	Ule Tank Farm, La Salina-Amuay Bay, Paraguana, Venezuela
Corporacion de Fomento de Chile	45	8	Planned	Manantiales (Spring Hill), Tierra del Fuego, Chile
Imperial Pipe Line Co.	450	16 or 18 or 20	Planned	Edmonton area-Regina, Canada
Imperial Oil, Ltd.	350	..	Under consideration	Regina, Sask.-Winnipeg, Man., Canada
Iraq Petroleum Co., Ltd.	1,080	16	Under way	Company crews—Kirkuk, Iraq-Haifa, Palestine, and Tripoli, Lebanon
Iraq Petroleum Co., Ltd.	556	30-32	Planned	Iraq-Levantine port
Kuwait Oil Co., Gulf, and Anglo-Iranian	1,325	12-22-30	Planned	Kuwait, Arabia, gathering lines and trunk line to Levantine port
Middle East Pipe Line Co.	800	34-36	Planned	Iran-Levantine port
Petroleos Mexicanos	287	12	Under way	Pemex crews—Poza Rica-Salamanca, Mexico
Santos Jundiai Railroad	30	18	Planned	Santos-Sao Paulo, Brazil
S.A. Petrolera las Mercedes (Texas Co. and Caracas Petroleum Co.)	157	16	Completed	Las Mercedes field—Pamatacual, Venezuela
Trans-Arabian Pipe Line Co.	1,070	30-31	Under way	Abqaiq-Saudi Arabia-Sidon, Lebanon
Yacimientos Petroliferos Fiscales de Argentina	400		Planned	Plaza Huincul-Bahia Blanca, Argentina
Yacimientos Petroliferos Fiscales de Bolivianos	255	6	Under way	Camiri-Cochabamba-Sucre, Bolivia

TABLE 2—FOREIGN PRODUCTS-LINE PROJECTS

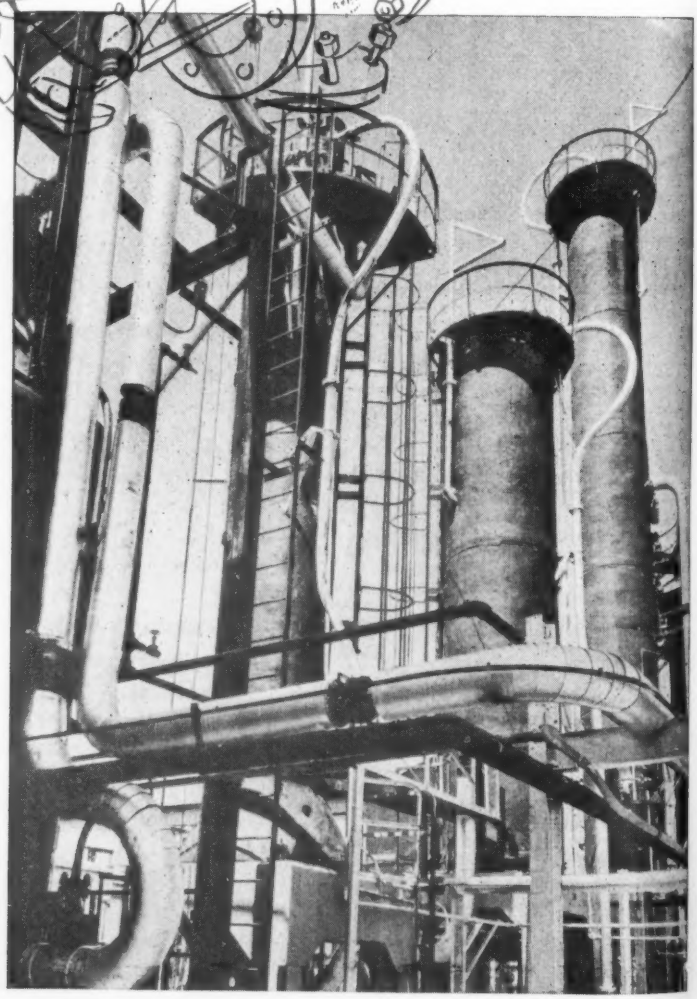
Company—	Miles	Diam. (in.)	Status	Location
Cia. des Pipe Lines Petroliers Francais*	150	10	Planned	Le Havre-Paris, France
Colombian Government	342	.	Planned	Puerto Berrio-La Dorada, 92 miles; La Dorada-Bogota, 110 miles; La Dorada-Cartago, 140 miles
Creole Petroleum Corp.	10	8	Under way	Catia de la Mar to Nueva Caracas, Venezuela
Ministry of Petroleum of Colombia and Antioqua R.R.	107	.	Planned	Puerto Berrio-Madellin, Colombia
Santos Jundiai Railroad	40	10	Planned	Santos-Sao Paulo-Campinas, Brazil
Svenska Enterprenad Aktiebolget*	220		Planned	Uddevalla-Vasteras, Sweden
United Kingdom Government	150	6	Under way	Shell Petroleum Co. supervision—Mtwara, near Lindi, to Ground Nuts area, Tanganyika, Africa

TABLE 3—FOREIGN NATURAL-GAS PROJECTS

Company—	Miles	Diam. (in.)	Status	Location
Canadian Western Natural Gas Co., Ltd.	11	16	Completed	Loops Calgary area
Canadian Western Natural Gas Co., Ltd.	8	5-10	Authorized	Calgary area
Cia. Mexicana de Gas de Monterrey	35	12	Completed	Mission and Camargo fields to Roma-Monterrey line, Mexico
Direccion General del Gas del Estado	1,100	10	Under way	Tecnica and government crews—Comodoro Rivadavia-Buenos Aires, Argentina
Northwest Natural Gas Co.	600	24	Planned	Alberta fields to Vancouver, B. C., Seattle, Wash., and Portland, Ore.
Petroleos Mexicanos	150	20	Under way	Poza Rica-Mexico City, Mexico
Petroleos Mexicanos, Mexican Gas Co., and Industrial Gas Co.	600	..	Planned	Reynosa, Tamaulipas-Mexico City
Regie Autonome des Petroles	114	6.9	Under way	Toulouse-Bordeaux, France
U.S.S.R. (reported)	360	..	Under way	Dashiva (in Carpathians)-Kiev, Ukraine
Western Pipe Line Co.	850	..	Planned	Calgary-Saskatoon, Alta.-Winnipeg, Man.

*Deferred projects.

REFINING EFFICIENCY



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Arc Welding Speeds Construction of New Gas Pipe Lines

By R. L. Looney, Welding Engineer
The Lincoln Electric Company, Tulsa, Oklahoma

Fig. 1. Tack welding 30″ pipe on the 68-mile pipe line now being built for the Warren Petroleum Company Cycling Plant at Lindsay, Oklahoma. Shows clamp used for aligning pipe prior to tack welding. Contractors: The Pipe Line Service Company, Inc., Seminole, Oklahoma.

Fig. 2. Completing final pass on 30″, 48-pound, gas vacuum pipe line for Cycling Plant gathering system with 5/32″ "Fleetweld 5" electrode and using engine driven Lincoln "Shield-Arc" welders. Joints are hydrostatic tested and then coated before lowering in the ditch.

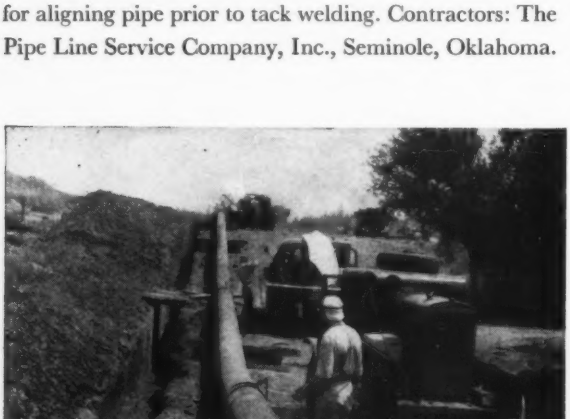

Fig. 3. Laying the 16″ pipe line for the Oklahoma Natural Gas Company using the "stove-pipe" method, except in road and river crossings where the "bell-hole" method is followed. This 80-mile line is built mostly from reclaimed pipe using arc welding to build up corroded sections. Contractor: The Trojan Construction Company, Oklahoma City, Oklahoma.

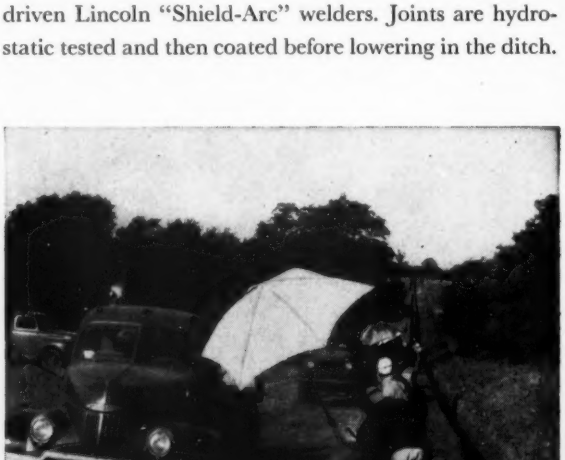

Fig. 4. Completing a weld on the 16″ pipe with 3 passes of 5/32″ diameter "Fleetweld 5" electrode. Standard plain end 30° bevelled joint without liner is used. The pipe is covered with two protective coatings and wrapped with fiber glass.

The above is published by **THE LINCOLN ELECTRIC COMPANY** *in the interests of progress.*
Additional information on welding pipe lines, refinery construction and maintenance are given in the Procedure Handbook. Price $1.50. Write for a copy to The Lincoln Electric Company, Dept. 226, Cleveland 1, Ohio.

Socony-Vacuum Oil Co., Inc., plane used for cargo unloading at Maiquetia, Venezuela

Export Controls Chief Factor Limiting Petroleum Equipment Leaving Country

by Bertram F. Linz

WORLD demand for American petroleum equipment continues unabated, its fulfillment limited more, apparently, by export controls which restrict the volume of goods leaving this country than by lack of dollar exchange abroad.

Figures compiled by the Department of Commerce especially for this issue of The Oil and Gas Journal show that exports during the first half of this year exceeded even those of the corresponding period in 1947 which, in turn, totaled slightly more than exports for the entire year 1946.

And although exports since the end of the war have exceeded $265,000,000, they do not appear to have satisfied the demand even for essential immediate expansion nor to have contributed more than a start to planned long-range development. However, the statistics on 1948 shipments indicate a slight drop in exports of drilling equipment and a marked increase in welded casing and line pipe, the latter due entirely to heavy shipments to Saudi Arabia and Venezuela, while seamless casing and line pipe and other equipment moved at about the same rate as in 1947.

American exporters of petroleum equipment find themselves handicapped by three separate, yet interrelating, factors—exchange difficulties, export controls, and United States international policy.

The fact that Latin-American and other countries which have been suffering from a lack of dollar exchange have been able to scrape up the money to pay for United States equipment, while cutting down drastically on their purchases of other commodities here, demonstrates the importance they place on the quick expansion of their oil industries.

Look to U. S. for Supplies

While some small quantities of petroleum equipment are being produced in Europe, world operators on the whole look to the United States for supplies, both because they prefer the American product and because this country is the only one with large-scale production. But practically every government has strict controls upon exchange and imports which often affect even American companies that have dollar profits from which they could pay for new equipment.

For the Western European countries, the Marshall plan is designed gradually to eliminate this difficulty, but countries not participating in the European recovery program will be able to improve their exchange position only by selling more of their own products in dollar markets. It is significant, however, that although the exchange position of many of the countries in the latter category was even more strained in the first half of 1948 than it had been a year earlier, they continued to find dollars with which to buy oil equipment.

This is explained by government officials in Washington as due to the desire to spend such dollars as may be available for capital goods that will permit an increase in domestic supplies and thus reduce the necessity for imports which, in the long run, would require the provision of even more dollar exchange. Within the equipment industry, originally, there was a division of opinion as to the probable effect of these controls, but it now appears that, while they will impose some limitations, they will still leave available a substantial immediate market for goods for which there is essential need.

While exchange difficulties thus limit the volume of equipment that can be purchased by foreign operators, export controls make impossible even the shipment of as much equipment as could be sold abroad under those difficulties.

Under the Export Control Act, the Department of Commerce, through its office of international trade, determines the amount of petroleum equipment and certain other commodities that may be shipped out of the country to destinations other than Canada, setting up quarterly quota limits to which exports must be restricted. Canada is not subject to these limitations, by virtue of the so-called Hyde Park agreement entered into during the war.

The basic idea of the export controls is to insure that domestic operators have sufficient equipment to meet at least their minimum needs and to channel the remainder to the countries where, in the opinion of government officials, it will produce the greatest additions to the world supply of oil.

The department's handling of steel exports has been sharply attacked by certain groups of domestic business

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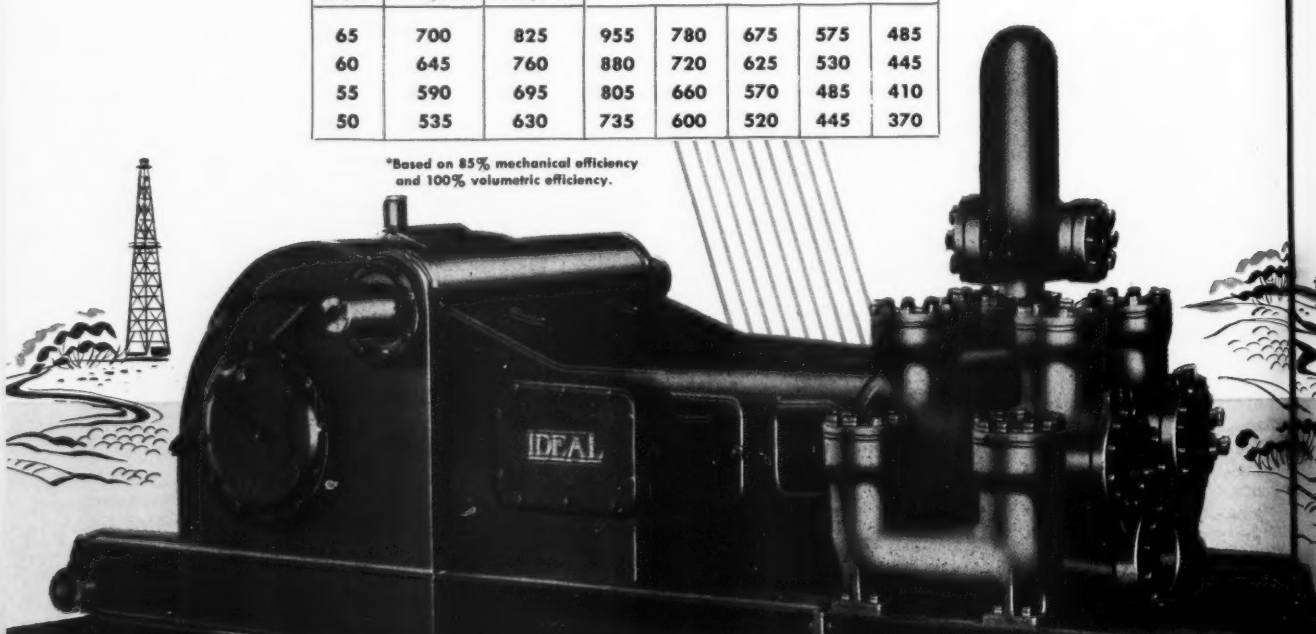
Performance Chart

LINER SIZE, INCHES	8½	7¾	7¼	6¾	6¼
Maximum Discharge Pressure, PSI . . .	1260	1535	1780	2085	2480
Volume Per Stroke, Cubic Inches . . .	3385	2775	2400	2045	1720
Volume Per Stroke, Gallons	14.66	12	10.4	8.85	7.44

Pump Speed in SPM	Rated Output Horsepower	*Nominal Input Horsepower	*Gallons Per Minute				
65	700	825	955	780	675	575	485
60	645	760	880	720	625	530	445
55	590	695	805	660	570	485	410
50	535	630	735	600	520	445	370

*Based on 85% mechanical efficiency and 100% volumetric efficiency.



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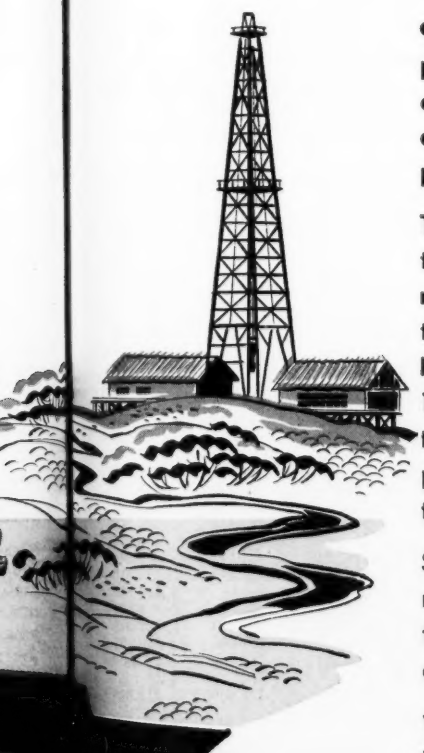

• Here, for the first time in the drilling industry is a power pump that makes light work of circulating mud to great depths. With the Type E-700, drillers can now obtain adequate mud volume at higher pressures than ever before possible with a power slush pump.

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men and criticized by members of Congress to whom they have taken their complaint that the control was not serving its primary purpose of reserving enough material to meet essential needs in this country.

The export control law, extended for 1 year from last February 28, will expire within a few weeks and, while it is anticipated legislation will be enacted to continue it, the whole question of exports is expected to be exhaustively debated in Congress.

International policy also makes itself felt in the administration of the European recovery program, under which a maximum volume of equipment is to be channeled to the Marshall plan countries to enable them to get on a self-supporting basis and reduce the drain on our own supplies of oil, while at the same time countries not participating in the program

(Continued on page 215)

UNITED STATES EXPORTS OF PETROLEUM EQUIPMENT BY DOLLAR VALUE AND BY COUNTRY OF DESTINATION

Country—	Casing and line pipe (seamless)		Casing and line pipe (welded)		Petroleum and gas well-drilling-apparatus and parts		Other petroleum well and refining machinery and parts	
	1947	First 6 mo. of 1948	1947	First 6 mo. of 1948	1947	First 6 mo. of 1948	1947	First 6 mo. of 1948
Schedule B—Commodity classifications:	6,062	.....	6,063	.....	7,342	.....	7,349	.....
Canada	1,394,527	1,219,387	498,459	241,185	3,257,415	3,104,199	1,677,235	1,393,268
Mexico	1,209,548	512,656	1,793,250	108,821	1,747,041	1,305,804	663,134	436,517
Bahamas	55,326	.....	.....	239	49,537	.....	48,767	2,227
Cuba	85,285	29,345	20,821	7,413	135,503	63,498	168,238	42,384
Jamaica	5,296	.....	4,401	3,234	5,542	1,562	1,461	4,249
Trinidad	707,682	98,446	57,557	4,859	737,019	323,812	453,648	495,993
Curacao (N.W.I.)	57,273	44,568	96,668	10,082	14,366	.....	334,333	302,148
Other	239,528	32,986	84,370	25,168	359,004	21,801	67,267	12,747
Total North and Central America	3,754,465	1,937,388	2,555,526	401,001	6,305,427	4,820,676	3,414,083	2,689,533
Columbia	1,787,874	456,011	515,232	34,865	3,965,054	1,008,138	756,021	414,494
Venezuela	13,973,056	7,488,790	3,007,545	2,683,480	20,798,523	9,053,081	5,763,253	4,296,826
Ecuador	186,721	14,555	4,759	4,546	637,981	207,799	83,580	31,064
Peru	498,107	208,344	31,083	532	1,152,830	452,909	277,796	425,167
Bolivia	31,087	41,822	242,976	608,939	40,850	19,182	4,739	1,460
Chile	326,022	191,129	21,099	136,389	201,359	113,472	249,227	83,303
Brazil	247,830	78,161	60,321	40,963	250,341	118,515	154,716	40,024
Paraguay	30,917	7,584	1,053	1,248	118,928	71,130	86,863	13,602
Uruguay	.....	3,913	.....	7,667	18,756	17,440	4,137	6,411
Argentina	968,953	242,377	69,677	40,814	4,312,221	1,449,683	1,756,930	674,877
Other	5,851	11,650	412	2,734	3,420	1,435	1,737	1,155
Total South America	18,056,418	8,744,336	3,954,157	3,762,177	31,500,263	12,512,784	9,138,999	5,988,383
Sweden	87,058	1,053	.....	.....	1,746	.....	1,621,678	394,057
United Kingdom	5,684	.....	.....	.....	143,556	212,262	177,887	98,552
Netherlands	112,267	97,654	18,035	43,886	189,720	75,241	236,190	97,394
France	178,943	5,843	30,633	8,100	3,034,940	296,357	1,372,675	638,127
Czechoslovakia	.....	.....	.....	.....	.....	214,690	999	1,402
Switzerland	.....	.....	.....	.....	6,898	.....	7,384	160
Poland and Danzig	50,030	50	.....	.....	706,859	451,383	185,491	1,482
U.S.S.R. (Russia)	1,467,348	.....	52,145	.....	4,950,562	1,374,698	4,772,488	1,156,160
Yugoslavia	.....	.....	.....	.....	35,994	.....	40,421	.....
Romania	.....	.....	.....	.....	.....	1,170,889	.....	.....
Other	107,234	105,449	30,376	10,524	330,547	*446,051	198,263	100,828
Total Europe	2,008,564	210,049	131,189	62,510	9,400,822	4,241,571	8,613,476*	2,488,162
Turkey	17,266	109,803	.....	8,168	93,214	370,477	164,258	42,825
Syria	68,726	.....	2,445	.....	114,692	36,023	28,434	7,921
Lebanon	.....	29,259	.....	56	.....	105,573	.....	18,936
Iraq	103,184	89,462	.....	2,154	620,354	315,661	28,015	24,728
Iran	160,652	3,010	.....	.....	331,755	101,427	204,666	246,091
Palestine and Trans-Jordan	322,333	22,818	3,873	.....	171,559	27,690	93,478	6,697
Kuwait	1,031,555	871,572	73,108	285,763	2,765,978	854,737	265,964	205,638
Saudi Arabia	1,614,537	1,106,660	2,496,222	5,761,961	1,564,201	577,215	1,163,431	629,808
Arabian Peninsula States	.....	.....	.....	.....	.....	160	354	3,800
Bahrein	243,432	443,624	40,067	102,449	707,855	128,106	241,562	232,849
India	246,720	257,795	158	.....	1,491,234	274,578	1,410,292	163,012
Pakistan	.....	141,893	.....	1,289	.....	97,319	.....	256,982
Burma	.....	.....	.....	.....	186,207	180,695	105,029	9,981
British Malaya	289,006	131,379	132,467	549	829,712	295,056	131,897	82,576
Netherlands Indies	1,341,440	1,077,770	197,070	90,780	3,147,725	978,589	1,151,068	1,063,181
Philippine Islands	95,469	10,476	4,878	21,558	389,483	9,352	65,796	183,534
South and Southeast Asia	.....	.....	.....	.....	.....	.....	.....	.....
China	21,150	17,644	30,564	.....	298,821	131,869	130,055	319,642
Japan	.....	.....	.....	.....	.....	.....	.....	.....
British India	.....	.....	.....	.....	.....	.....	.....	.....
Australia	28,473	20,752	15,930	.....	391,025	108,575	128,176	37,716
New Zealand	2,232	.....	.....	.....	2,023	.....	1,195	2,095
Other	10,845	26,999	3,545	20,195	260,273	149,885	45,440	60,556
Total Asia and Oceania	5,597,020	4,360,916	3,000,327	6,294,922	13,366,111	4,742,987	5,359,110	3,598,568
French Morocco	99	13,308	.....	.....	462,825	34,295	751,115	27,922
Algeria	2,720	12,087	10,777	.....	136,991	17,200	345,325	62,175
Tunisia	46,188	.....	89	.....	337,294	24,442	252,009	45,248
Egypt	178,065	127,431	88,111	8,191	1,193,537	340,686	192,232	304,033
Canary Islands	6,163	3,167	304	647	.....	.....	43,358	30,597
French and Equatorial Africa	74,806	55,350	.....	.....	396,646	14,001	76,602	12,167
Union of South Africa	19,221	10,245	.....	.....	78,527	76,752	32,841	18,243
Other	169,470	2,664	11,712	1,247	327,204	82,318	62,339	6,576
Total Africa	496,732	224,252	110,993	10,085	2,933,024	589,694	1,755,821	506,961
Total world	29,913,199	15,476,941	9,752,192	10,530,695	63,505,647	26,907,712	28,281,489	15,271,607

*Includes United States exports by dollar value to the following countries: Hungary, 128,173. and Greece, 167,629. U. S. Department of Commerce, September 6, 1948.

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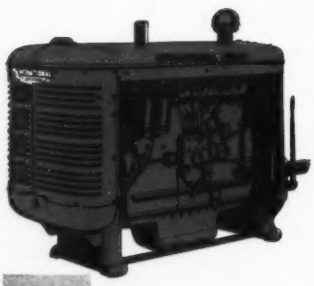

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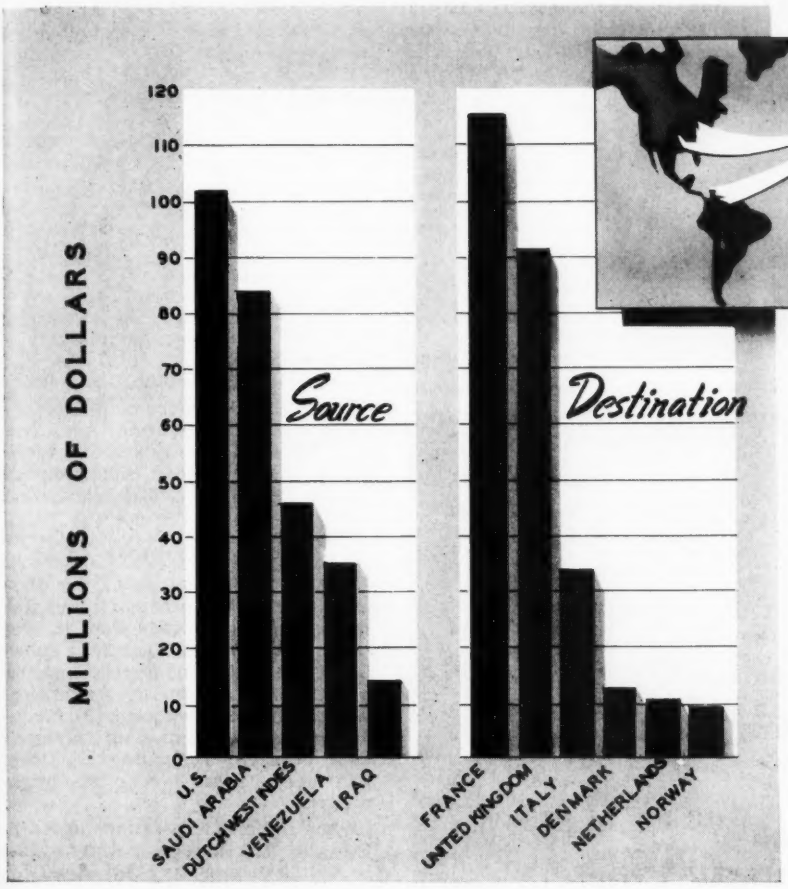


The left-hand vertical-bar chart shows the "Sources" or oil procurement authorizations by area of origin. The bars represent in dollars the total for crude oil, gasoline, fuel oil, and other products, by countries. The right-hand vertical-bar chart gives the total dollar amounts for crude oil and products as to "Destination" areas (see Tables 1 and 2). The inset map shows relative flow of crude and products to the European area, from sources of origin. Included in this article is a tabulation of the dollar value of crude oil, gasoline, fuel oil, and other products that have been shipped to the various ERP receiving countries, April 3-October 31, 1948

by Bertram F. Linz

FOREIGN OIL POLICY

Revolves Around ECA

CONTROLLING factor in United States foreign policy, today and for at least 3 years to come, is the European Recovery Program.

That program just about sums up our present policy with regard to western Europe and definitely tinges our policy elsewhere because the purchases generated by the billions of dollars this country is granting to the Marshall plan countries will be spread over all parts of the world, including even some nations within the orbit of Communist Russia.

The importance of the trade sparked by the European Recovery Program is readily apparent. In the first 8 months of its operations, the Economic Cooperation Administration made grants to Europe totaling $3,700,653,000, and probably will pour another $10,000,000,000 into the effort before the program terminates on June 30, 1952, and in addition several billion dollars are to be loaned to the Marshall plan countries to finance the rehabilitation of internal developments. Of the amount already disbursed, more than $216,000,000 was for procurement in 15 Latin-American countries, $472,000,000 in Canada and Newfoundland, $250,000,000 within the participating countries and their dependencies, and $175,000,000 in other countries, half of it for oil from Saudi Arabia.

The dual purpose of the Marshall plan is to aid in the rehabilitation and expansion of European industry so that a prosperous world may be developed and to build up, on both sides of the Atlantic, a solid front against the spread of communism to insure a peaceful world. Both of these efforts are meeting with success—European productivity already has been increased markedly, communists in Italy and France have been defeated in elections, and military alliances are shaping up for defense against any "aggressor," a word which today is a euphemism for Russia.

The European Recovery Program had its genesis in an address by Secretary of State George C. Marshall at Harvard University in 1947, in which he suggested a joint effort by the United States and western Europe to rehabilitate and expand the latter's war-wrecked industrial economy.

Marshall's ideas were enthusiastically received in Europe where, although Russia and her satellites refused to participate and have since consistently attempted to sabotage the effort, a Committee for European Economic Cooperation was organized to formulate a program which, after review and modification by our own government experts, eventually became the framework of the Foreign Assistance Act of 1948.

That act set in motion a 51-month program designed to put Western Europe on its feet at a cost to this coun-

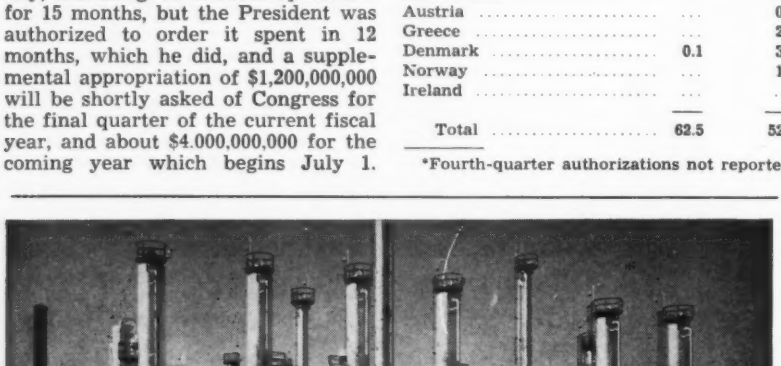
try estimated in the neighborhood of $16,000,000,000. The initial appropriation was $5,000,000,000 for the Economic Cooperation Administration and $55,000,000 for use of the State Department on previously adopted aid programs.

The ECA appropriation, incidentally, was designed to cover operations for 15 months, but the President was authorized to order it spent in 12 months, which he did, and a supplemental appropriation of $1,200,000,000 will be shortly asked of Congress for the final quarter of the current fiscal year, and about $4,000,000,000 for the coming year which begins July 1.

TABLE 1—PROCUREMENT AUTHORIZATIONS, APRIL 3-NOVEMBER 15, 1948
(In millions of dollars)

	Crude oil	Gasoline	Fuel oil	Other	Unclassified*	Total
France	36.6	12.1	4.7	16.7	45.3	115.5
United Kingdom	5.0	29.8	12.3	30.1	13.8	91.0
Bizone Germany	1.5	...	...	...	5.2	6.7
French Germany	...	0.6	...	1.9	1.7	4.2
Italy	19.3	1.1	6.2	5.4	3.0	34.9
Netherlands	...	2.2	1.2	7.4	...	10.8
Austria	...	0.3	0.1	0.3	0.4	1.0
Greece	...	2.2	1.5	2.5	1.6	7.8
Denmark	0.1	3.0	1.3	6.2	2.3	12.9
Norway	...	1.5	0.6	4.3	3.0	9.5
Ireland	...	...	...	...	1.8	1.8
Total	62.5	52.7	28.0	74.8	78.0	296.1

*Fourth-quarter authorizations not reported by type of product.



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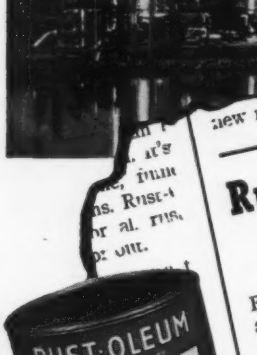
Rust-Oleum forms a tough, enduring coating that protects roofs, tanks, machinery, pipes, structural steel, metal buildings, and other rustable metal from the ravages of rust. Rust-Oleum outlasts ordinary protective materials two to ten times, depending on conditions under which it is used.

Maintenance men hail Rust-Oleum's cost-cutting advantages. It can be applied to new metal or on rusted metal after quick, easy preparation, and gives extra coverage per gallon.



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Because Europe has been able to develop additional financial resources as a result of the aid already provided, it is expected the program will cost the United States less each year.

Major Objectives

The major objectives of the program are (1) to promote industrial and agricultural production in the participating countries; (2) further the restoration or maintenance of the soundness of European currencies, budgets, and finances, and (3) facilitate and stimulate the international trade of the participating countries with one another and with other countries.

When it started operations in April 1948, the ECA had as its only guide the tentative programs developed by CEEC. Experts in Washington considered that these programs, many of which were undisguisedly padded, represented ideal rather than practical objectives, and they were pared down drastically.

At the outset, the procurement programs submitted monthly by the participating countries were little more than "shopping lists" largely confined to materials and products needed for immediate relief purposes. But while it filled these lists to the extent its experts considered appropriate, ECA worked toward development of long-range programs which would speed up the wheels of European industry and the perfection of the machinery through which they must pass.

A new group, the Organization for European Economic Recovery, superseded the CEES as the clearing house through which the individual countries submitted their programs, and ECA demanded that quarterly schedules be developed well in advance so that procurement of equipment which requires time for manufacture could be booked and business generally conducted in a more normal manner.

These long-range programs are beginning to reach Washington, although as yet it has been impossible to work out any coherent schedules for petroleum equipment.

Since the United States undertook

to furnish Europe with materials and equipment of which it was seriously short itself at the time, a number of restrictions on the administration of the program were written into the law by Congress and others were adopted voluntarily by ECA to protect the American economy.

These restrictions provided, among other things, that in the case of petroleum as much as possible should be procured from outside the United States so as to assure adequate supplies here for domestic use; that prices paid for oil delivered in ECA countries should not be in excess of the prevailing United States market price plus transportation from the United States to those countries, and that prices paid under ECA commitments may not exceed those paid by other customers similarly situated.

The machinery which ECA has set up for meeting the needs of the Western Europe countries is designed to fit the activities of each into the picture of the area as a whole.

Each country now submits its programs to OEEC in Paris, which studies and revises them in the light of general European needs and problems, reviews and coordinates production, consumption, and import-export targets, and recommends the amount of ECA aid which should be extended.

Programs to Washington

The programs as revised by OEEC are transmitted to Washington, where they are again reviewed in the light of suggestions from ECA missions in the several countries, their conformity with the objectives of ECA, availability of supplies and dollars, and the legal limitations of the foreign-aid legislation.

After further negotiations through OEEC, winding up with acceptance of the revised programs by the participating countries, the approved ECA allotment is divided into quarters and supply programs are prepared by each country showing how and where its share of the funds is to be spent.

The procurement of oil by the Marshall plan countries is supervised by a petroleum branch set up in ECA, which also provides for the cost of transportation and will administer the petroleum - equipment program, the last being its major headache currently.

In the original estimates, the CEEC called for some $1,800,000,000 worth of petroleum equipment over the period of the program, one-third of it, approximately, to be supplied by the United States and the remainder in Marshall plan countries themselves. This figure was immediately decided in Washington to be too high, but over a period of a year little advance has been made toward getting realistic programs from the individual countries and very little money has so far been allocated.

European manufacturers, however, are increasing their petroleum equipment output and there is every indication they will be able to make good on the CEEC promise that two-thirds of the equipment would be produced in Western Europe. The greatest demand on the United States now is expected to be for products which

TABLE 2—PROCUREMENT AUTHORIZATIONS BY AREA OF ORIGIN
(In millions of dollars)

	Crude oil	Gasoline	Fuel oil	Other	Unclassified*	Total
United States	2.5	20.0	3.1	47.1	37.1	109.9
Canada	....	....	....	0.1	....	0.1
Venezuela	17.4	3.2	1.3	4.1	9.1	35.1
Mexico	....	....	....	....	0.3	0.3
Latin America†	...	....	....	....	2.7	2.7
Dutch West Indies	0.6	19.8	8.1	16.4	1.7	46.6
Bahrein	....	1.0	0.2	8.0	...	2.0
Trieste	....	0.2	0.1	...	....	0.3
Saudi Arabia	28.0	8.2	14.7	5.6	27.5	84.0
Iraq	13.6	....	0.5	...	....	14.1
Iran	0.6	0.1	....	0.3	....	1.0

*Fourth-quarter authorizations not reported by type of product. †Countries not specified.

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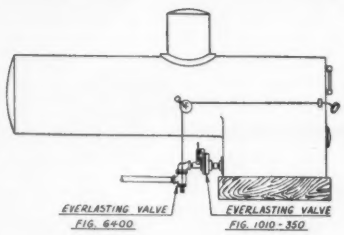

QUICK ACTING — For manual operation
Figure 1010-300 for 300 lb. pressure
Figure 1010-350 for 350 lb. pressure

Straight through blow — no clogging
Drop tight seal — maintained by pressure
Stellite Faced Disc regrinds itself
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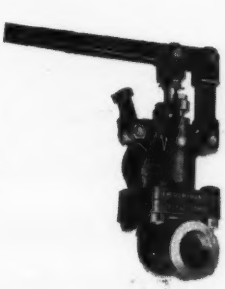

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Orbit's friction free Seating principle coupled with yielding seat sealing surface prevents leaks from vibration and variations in temperature. These seats will not gall.

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OIL COUNTRY RATED VALVES
are recommended for installations such as: Christmas Trees, Field Lines, Header and Separator Manifolds, Pipe Line Bypass Manifolds, Car Loading Racks, L P Gas Lines, and where temperatures do not exceed 275° Fahr.

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7. **Stem Thrust Bearing.**
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9. **Operating mechanism is isolated from line of flow and pressure.**
10. ***Seal* is effected *without lubricant*.**

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the European industries cannot manufacture, such as large-diameter line pipe and special items of equipment.

When the equipment programs actually are submitted they will be carefully review to insure that the Marshall plan countries have heeded ECA's admonition not to attempt to convert to an oil economy where other fuels are available.

TABLE 3—SHIPMENTS BY COUNTRY OF DESTINATION, APRIL 3-OCTOBER 31, 1948
(In millions of dollars)

	Crude oil	Gasoline	Fuel oil	Other	Total
United Kingdom	5.6	27.4	13.0	24.2	70.2
France	30.0	7.4	2.0	8.7	48.1
Italy	6.6	0.4	4.8	1.8	13.6
Netherlands	...	...	0.2	0.9	1.1
Austria	...	...	...	0.2	0.2
Greece	...	1.4	0.3	1.2	2.9
Norway	...	0.2	0.1	0.8	1.1
Denmark	...	1.6	0.9	3.2	5.7
Total	42.2	38.4	21.4	41.0	143.0

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The CEEC reports showed that the participating countries were planning the large-scale conversion of industrial plants from coal to fuel oil, the dieselization of railroads, and the mechanization of agriculture. The first two will not be approved where coal is readily available, and all three of these objectives are, naturally, dependent upon the availability of steel and equipment.

ECA officials, further, will attempt to limit the expansion of the European refining industry to the level required to make the area self-supporting and will not assist in the building of industries to the point where they will have surplus production for export, which could lead either to the eventual development of cartels or a situation where one country would be in a position to dominate the European oil trade.

ECA plans call for a self-sufficient Europe, but officials have ever in mind the effect of the recovery program on American industry in years to come. Without ECA, the flow of oil to Europe from world sources would have been completely disrupted and the repercussions here and elsewhere would have been most serious, but as European companies expand their production and refining there are bound also to be effects on our own foreign trade. ECA hopes to minimize these effects by preventing overexpansion of European facilities.

Definite Policy Not Reached

The situation of the American companies engaged in operations in Europe has been the subject of much consideration by ECA officials, but a definite policy has not yet been reached regarding the extension of Marshall plan aid to those concerns.

Currently, the thing appears to be that if American companies, operating alone or in partnership with Eupean interests, can contribute to the European economy through expansion they should be eligible for ECA aid. But that aid would not be extended to permit American interests to undertake new adventures that would lead to new distribution patterns and unnecessary and undesirable competitive situations.

While the question of ECA aid for American companies has not been settled, the ECA is attempting to press that part of the foreign assistance program which provides for guaranties to American companies covering the transfer into dollars of proceeds from new investments to the extent of 100 per cent of the dollars invested. The purpose of this provision of the act is to induce American capital to seek profitable employment abroad where it will help to promote economic recovery.

Total authorization for the procurement of petroleum issued by ECA between April 3, when it began operations, and December 1 amounted to $366,209,000. This figure did not in-

clude grants to China, covered by a separate program in which $50,000,000 was earmarked for petroleum, practically all of which had been authorized by December 1 and $29,000,000 worth already received in China.

During the period between April 3 and November 15 the procurement authorizations for crude and products amounted to $296,100,000, as detailed in Table 1. Of this amount, $109,900,000 was for procurement in the United States, $84,000,000 in Saudi Arabia, $46,600,000 in the Netherlands West Indies, $35,100,000 in Venezuela, $14,100,000 in Iraq, and the remainder in Canada, Mexico, Bahrein, Trieste, Iran, and unspecified areas in Latin America, as shown in Table 2.

Actual shipments between April 3 and October 31, the latest date for which details are available, totaled $143,000,000, of which, as shown in Table 3, the United Kingdom received $70,200,000, France $48,100,000, and Italy $13,600,000, with the remainder split among the Netherlands, Austria, Greece, Norway, and Denmark.

It will be noted that these tables do not show figures for all of the Marshall plan countries, some of which did not seek funds for oil until recently, among them Sweden and Belgium-Luxemburg.

Procurement Authorizations

ECA records show that from April 3 to September 30, procurement authorizations for the shipment of dollar oil to participating countries were programed in the amount of 58,188,000 bbl., of which the Middle East furnished 27,261,000 bbl., Western Hemisphere areas outside the United States 21,198,000 bbl., and the United States 9,729,000 bbl. The United States' share represented about 17 per cent of the total quantity, although it amounted to one-third of the total value since shipments included products of relatively high unit value, such as lubricants, which accounted for 44 per cent of all oil procured in this country.

Procurement of petroleum and products, accordingly, appears to have been made outside the United States to the maximum extent possible, as required by the law, and shipments have been permitted from the United States only when the material could not be obtained elsewhere or it was necessary to supplement the maximum quantities procurable outside the United States. ECA's entire procurement in this country represented less than 2 day's production of crude.

ECA reports show it also is conforming with that provision of the act that the administrator "shall take fully into account the present and anticipated world shortage of petroleum and its products and the consequent undesirability of expansion in petroleum - consuming equipment where the use of alternate fuels or

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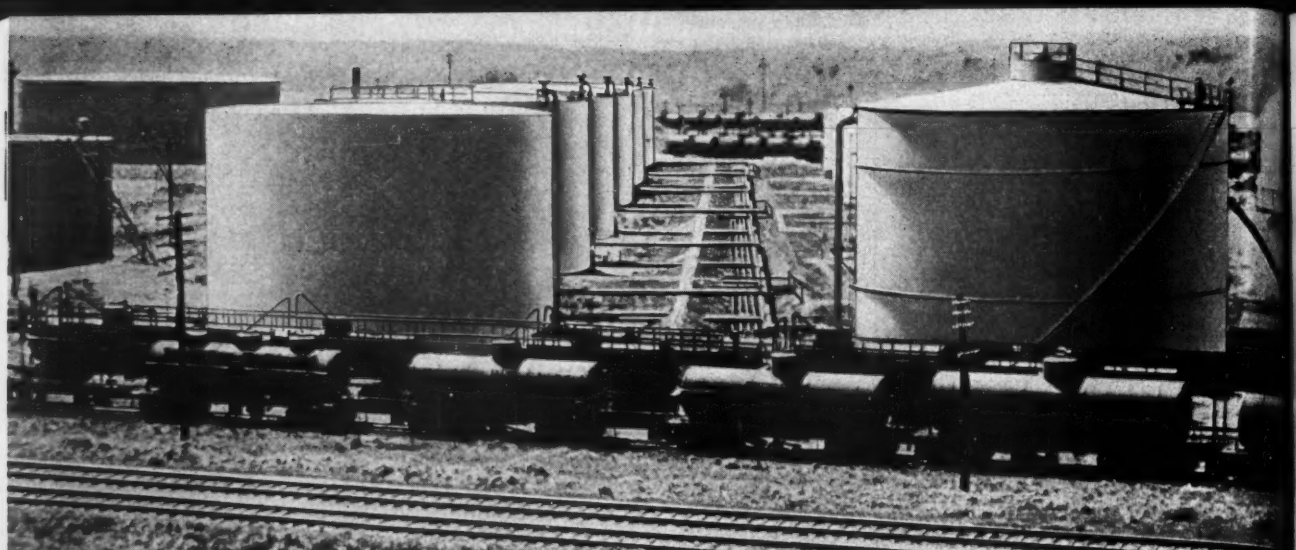

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other sources of power is practicable."

A number of European countries initiated programs during 1946 and 1947 for converting from coal to oil-burning equipment because of the great deficiency in their supply of coal. The rate of consumption of fuel oil, accordingly, increased rapidly during 1947, but the full force of these conversions did not show up until 1948.

In a recent report to the Congressional Joint Committee on Foreign Economic Cooperation, popularly known as the "watch dog committee," Walter J. Levy, chief of the ECA petroleum branch, explained that, in accord with the statutory restriction, each country is asked to present a statement on end uses.

"We have a historical background on end uses," Levy said, "and we would request them to eliminate luxury consumption during this period of shortage. It is all very well to permit consumption of petroleum products for uses which are not essential if the oil is available. Under present conditions it does not work out that way.

"Secondly, there is a great tendency in Europe to convert from coal to oil. Again, that cannot be done. We have to stop it. So we would undertake such kind of screening."

In line with this position, very little oil-burning equipment has been financed with ECA funds, and it was pointed out that oil exports from the United States to ECA countries in 1948 actually were some 40 per cent below exports during the same periods in 1947, although exports to non-ECA countries declined only by 6 per cent. In addition, further conversion from coal to oil-burning equipment in many of the European countries was suspended or retarded considerably.

Fuel-oil consumption in Europe, however, did not show an increase, but the increased requirements were secured from sources outside the United States. In this connection, it was pointed out that oil-burning equipment is also manufactured in Europe, and ECA is in no position to police installations of such equipment.

In recent months substantial changes have taken place in the relative position of coal and fuel oil. Supplies of fuel oil have materially increased, both in this country and Europe, and coal supplies also have increased in the participating countries, in some of which the prices of the two fuels have again become competitive, leading to some reconversion from oil to coal.

ECA officials take the view that the restrictions in the act are predicated upon an actual shortage in the supplies of petroleum and that, in the light of the existing supply situation, the need for them is less pressing and a modification of ECA policy appears to be justified.

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Foreign Production Up

(Continued from page 149)

In Latin America outside Venezuela, political conditions in some countries appear to have retarded development during the year. Production in Mexico was up to an estimated 160,000 bbl. daily, 4 per cent over 1947 and about 52 per cent over the expropriation year of 1938. Mexico continued to struggle with the difficulties of a state-operated industry and made overtures for foreign financial and technical assistance.

The production trend in Colombia continued downward with the average for the year figured at 62,000 bbl. daily against 68,100 bbl. daily in 1947, a drop of nearly 9 per cent. Some improvement is noted in the current production rate reported at 82,500 bbl. daily.

In Peru, Ecuador, and Brazil, discussions continued over revisions in laws to facilitate development by foreign companies. Peru's production of 38,000 bbl. daily was up nearly 9 per cent over 1947 but down 12.5 per cent from 1938. Trinidad's production was relatively unchanged at 56,000 bbl. daily but the considerable drilling now under way on the West Indies island may show results in next year's production. No commercial production is yet reported from Tierro del Fuego on the southern tip of Chile where a field discovery was made in late 1945, but this is expected possibly in 1949.

Indonesian Output Up

In the Far East, crude production of Indonesia, formerly the Netherlands East Indies, rose from 22,000 bbl. daily in 1947 to 84,400 bbl. daily in 1948 as a result of the rehabilitation of the fields in South Sumatra. Even with this marked increase, output of Indonesia, the principal producing area in the Far East, was still more than 46 per cent under 1938. Political strife in these islands still blocks entry to some fields and prevents resumption of operations.

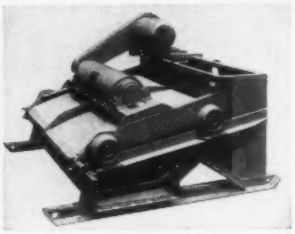
A notable increase in output, both over 1947 and 1938, was made in British Borneo. Here production rose to 54,500 bbl. daily against 36,100 bbl. daily last year and 18,900 bbl. daily in 1938. China's production continued negligible, and as far as the little available information shows, Japan's production is little changed. Production in Burma still is only a fraction of prewar volume, and industry leaders in this country have asked the government to clarify its intentions in regard to private oil operations.

Russia and the Eastern European countries were segregated in the accompanying table since production information on these countries is far less reliable than elsewhere. State-owned oil administrations have taken over operations, and few official figures made public on production. Russia is believed to be producing nearly 600,000 bbl. daily, a slight increase over its 1938 output. The country's oil potential is large but Russia has faced a difficult task in rebuilding war damage. Romania, which once supplied a considerable part of Europe's needs, is reported little changed from 1948 at about 78,000 bbl. daily. A lack of new discoveries in Romania and heavy production during the war has resulted in a decrease of more than 40 per cent from 1938 production.

SOLVING MUD PROBLEMS

Case History #5

McNEELY Vibrating MUD SCREENS



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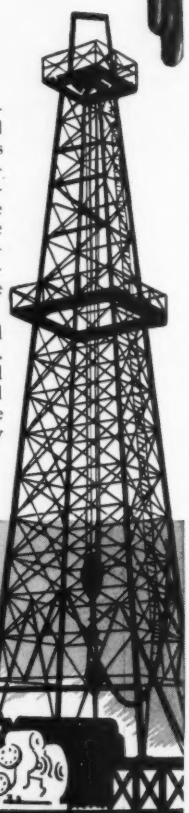

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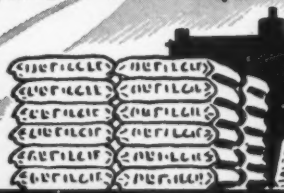

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Sinclair Plans to Resume Operations in Ethiopia

Local disturbances which interfered with Sinclair Petroleum Co.'s exploration in Ethiopia have ended, and the company is planning to begin drilling operations in the country early next year.

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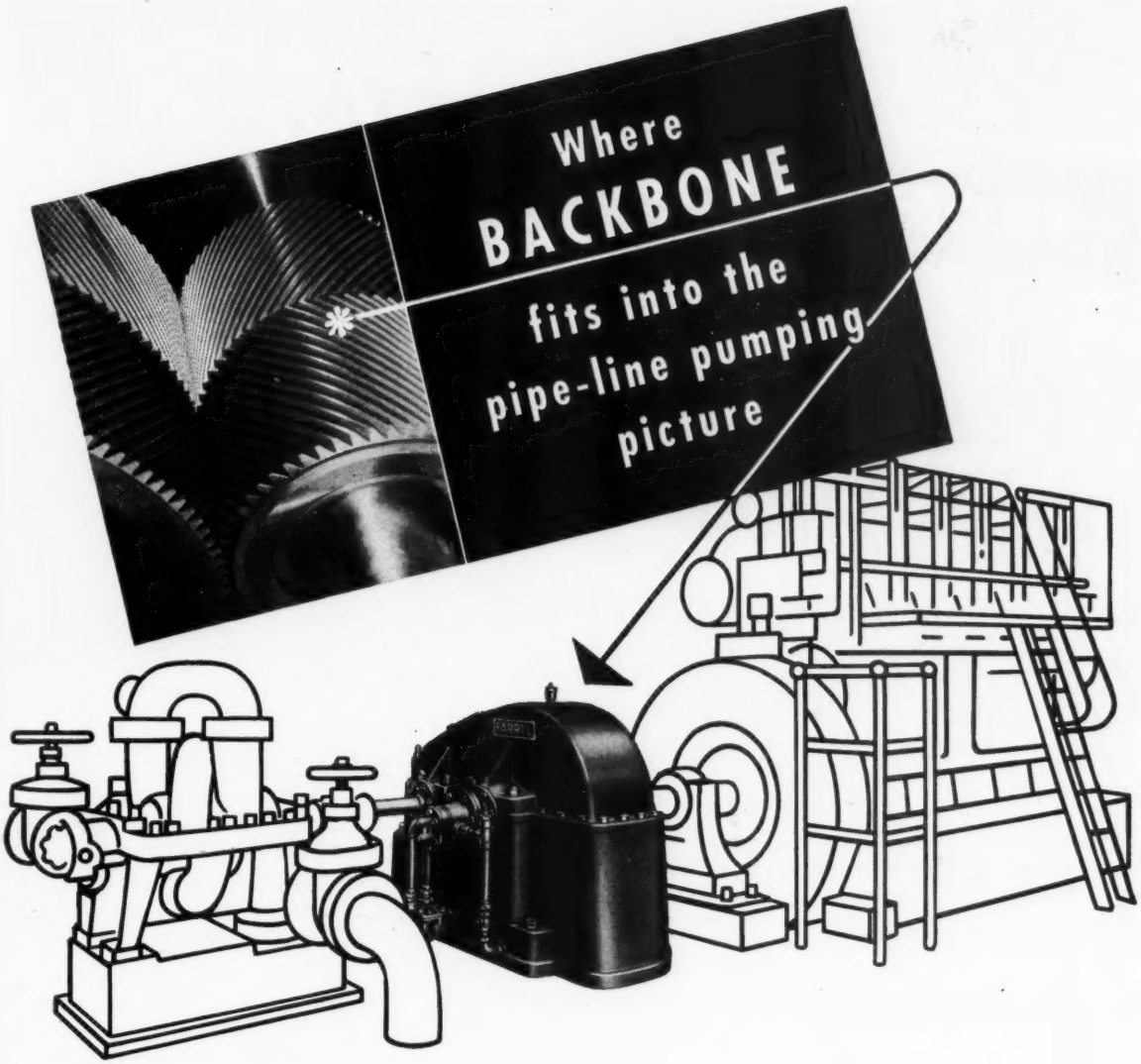

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Tanker Construction at Peacetime Peak

(Continued from page 155)
of the domestic intercoastal tonnage.

Construction Program

On a world-wide basis, the current construction program represents more than one-third of today's fleet. For individual major flags, however, the proportions of new capacity are quite startling. Of the approximately 143 T2 equivalents to be registered under the United States and Panamanian flags, there is represented by this new construction 22 per cent of the current total fleets of these two countries and 27 per cent of the privately owned fleets. For the British Empire, the present construction program represents 26 per cent of the total present capacity and 29 per cent of the nongovernment ownership under those flags. In the case of Norway, which has no government ownership of tankers, the present capacity under construction and on order for that nation is greater than the present fleet, being 112 per cent of the T2 equivalent vessels registered under that flag.

The present construction program is startling not only in its magnitude, but also because of the evolutionary changes occurring in design types. Of the 436 T2 equivalents under construction and/or on order world-wide today, more than 37 per cent have a speed under 14 knots, while 32.5 per cent are in the 14 knot group and 30.4 have speeds of 15 knots or more. Bet-

TABLE 5—OWNERSHIP OF UNITED STATES PRIVATELY OWNED TANK SHIP FLEET AS OF JANUARY 1, 1949

Ocean-going vessels 2,000 gross tons and over. (Source: U. S. Maritime Commission)

Owner—	Actual			T2-SE-A1 equivalents	
	No.	Average speed	D.W.T.	T2	T2 as per cent of total
Oil companies:					
Atlantic Refining Co.	13	13.9	220,400	12.6	3.1
Cities Service Oil Co.	17	14.6	282,400	16.9	4.1
Gulf Oil Corp.	43	13.4	639,200	35.3	8.6
Sun Oil Co.	21	13.3	320,000	17.4	4.2
Pan-American Petroleum & Transport Co.	14	13.7	216,500	12.2	3.0
Sinclair Refining Co.—Marine Dept.	13	13.6	175,400	9.8	2.4
Socony-Vacuum Oil Co., Inc.	21	14.8	342,400	20.8	5.1
Standard Oil Co. of California	18	13.8	250,600	14.2	3.5
Standard Oil Co. (N. J.)	62	13.9	1,011,600	58.0	14.1
The Texas Co.	28	13.9	391,700	22.4	5.4
Tide Water Associated Oil Co.	16	12.6	212,500	11.0	2.7
All other oil companies	63	14.1	944,000	54.8	13.3
Subtotal oil companies	329	13.9	5,006,700	285.4	69.5
Nonoil companies:					
National Bulk Carriers, Inc.	25	15.5	451,900	28.7	7.0
65 other nonoil companies	122	13.5	1,740,700	96.6	23.5
Subtotal nonoil companies	147	13.9	2,192,600	125.3	30.5
Grand total	476	13.9	7,199,300	410.7	100.0
Jan. 1, 1949, total private	476	13.9	7,199,300	410.7	100.0
Oil	329	13.9	5,006,700	285.4	69.5
Nonoil	147	13.9	2,192,600	125.3	30.5
Jan. 1, 1947, total private	267	13.5	3,720,100	221.9	100.0
Oil	224	13.4	3,052,900	182.1	82.1
Nonoil	43	14.3	667,200	39.8	17.9
Sept. 1, 1945, total private	261	13.0	3,262,500	194.6	100.0
Oil	208	12.9	2,591,900	154.6	79.4
Nonoil	53	13.4	670,600	40.0	20.6
Per cent change to Jan. 1, 1949, from:					
Jan. 1, 1947, total private	78.3	+3.0	+93.5	+85.1	....
Oil	46.9	+3.7	+64.0	+56.7	....
Nonoil	241.9	—2.8	+228.6	+214.8	....
Sept. 1, 1945, total private	82.4	+6.9	+120.7	+111.0	....
Oil	58.2	+7.8	+93.2	+84.6	....
Nonoil	177.4	+3.7	+227.0	+213.2	....

TABLE 6—UNITED STATES MARITIME COMMISSION TYPE WAR-BUILT TANK SHIPS AS OF OCTOBER 1, 1948

Vessels 2,000 gross tons and over. (Source: Vessel records branch, U. S. Maritime Commission)

Design type constructed and acquired:	Total constructed			Disposition							
				Returned to	Transferred			Sold and delivered to			
	No.	Designed D.W.T.	Computed total D.W.T.	private owners*	To Army	To Navy	Lost	Sold for scrap	U.S. citizens†	Foreign	Reserve fleet
Total all types	793	.....	.....	135	1	103	37	4	343	149	17
Total T1	32	.....	133,660	...	1	2	...	...	13	13	3
T1-MB-T1	12	4,130	49,560	...	..	1	...	...	9	2	...
T1-MB-T2	20	4,205	84,100	...	1	1	...	...	4	11	3
Total T2	536	.....	8,967,817	48	...	66	12	4	267	136	...
T2 or T2A	11	15,850	174,350	...	...	7	...	...	4	...	...
T2-SE-A1	481	16,765	8,063,965	48	...	16	12	4	‡263	135	...
T2-SE-A2	31	16,583	514,073	...	...	30	...	...	...	1	...
T2-SE-A2 (Mod.)	12	16,583	198,996	...	...	12	...	...	...	...	...
T2-SE-A3	1	16,433	16,433	...	...	1	...	...	...	...	...
Total T3	63	.....	1,122,030	19	...	35	3	...	6	...	...
T3-S-A1	12	16,015	192,180	12	...	...	...	...	...	...	...
T3-S-A1 (Mod.) AO	5	16,015	80,075	...	...	2	...	...	3	...	...
T3-S-A1 (Redesign)	2	16,015	32,030	...	...	...	...	...	2	...	...
T3-S-BF1	5	18,500	92,500	4	...	...	1	...	...	...	...
T3-S-BZ1	3	23,000	69,000	3	...	...	...	...	...	...	...
T3-S2-A1 (Mod.)	18	18,230	328,140	...	...	17	1	...	...	...	...
T3-S2-A1 (Redesign)	12	18,230	218,760	...	...	11	1	...	...	...	...
T3-S2-A3	5	18,354	91,770	...	...	5	...	...	...	...	...
T3-MAZ-1	1	17,575	17,575	...	...	...	...	...	1	...	...
Private (Coastal)	9	.....	.....	8	...	...	1	...	...	...	...
Private (Misc. ocean-going)	91	.....	.....	60	...	...	19	...	10	...	2
Total Z-ET1-S-C3	62	10,800	669,600	...	...	...	2	...	47	...	12

*Includes: Panamanian Flag—9 private (coastal), 5 private (miscellaneous ocean-going). Also includes 3 T2-SE-A1 and 1 2-ET1-S-C3 under general agency being repaired for sale. †Includes: Panamanian Flag—7 T1-MB-T1, 1 T1-MB-T2, 72 T2-SE-A1, 1 private (miscellaneous ocean-going). ‡Includes: Fort Dearborn, T2-SE-A1, sold for nonoperational purpose.

ter than 20 per cent of the total world construction falls within the 16 knot speed group alone.

With reference to size, it develops that 33.7 per cent are under 16,000 d.w. tons, 18.1 per cent fall within the 16,000-d.w-.ton group, and 48.2 per cent are 17,000 d.w. tons and over. The magnitude of increasing size is pointed up to a greater degree by the fact that 11.2 per cent of the present construction program falls within the 28,000-d.w.-ton group and 6.7 per cent in the group of 30,000 d.w. tons and over.

A question immediately arises regarding the effect of this construction program upon the future size of the world tank-ship fleets. It should be realized that these 436 T2 equivalents under construction or on order represent 90 per cent of the tonnage built in the two highest years of world tanker construction, namely, 1943 and 1944. With approximate delivery dates terminating by the end of 1952, it develops that in 1949 and in 1950 more than 238 T2 equivalents of this entire program will be delivered and in service.

The impact of this construction program can best be evaluated with relation to the present privately owned world fleet which represents 1,070 T2's and indicates the number available for commercial service. Few of the new vessels will be for government account, the only exceptions being the number for Argentine registry and less than six T2's for French registry. Not more than 20 T2 equivalents of the 436, therefore, would be for government service, leaving 416 for private account. This number represents an increase of 39 per cent over the present privately owned fleet.

In calculating the effect upon the world picture during the next 4 years, a range has been established showing the possible limits of these additions. With no allowance for scrapping overage vessels, or for marine and other losses, there would be 1,708 T2 equivalents by the end of 1952 as compared with nearly 1,469 T2's when full allowance is made for scrapping vessels 20 years and over.

Determinations by present fleet owners as to their rate of scrappage, therefore, will make a difference in the size of the total fleet involving 240 T2 equivalents within the next 4 years. Obviously, the decisions of private fleet owners based upon the economics of tanker transportation can result in either increasing the present capacity by approximately one-third or, on the basis of full scrappage, result in a fleet of 1,469 T2 equivalents representing an increase of 15 per cent over the present. Should the hypothesis of full allowance for scrappage be made and the world fleet at the end of 1952 approximate 1,469 T2 equivalents, it would result in a carrying capacity some 37 per cent above the present privately owned fleets world-wide.

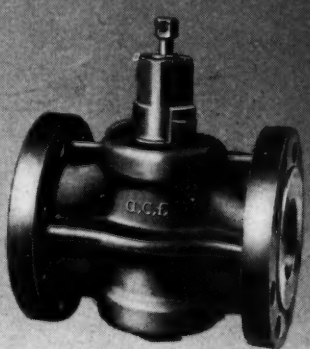
There can be little question that the next 4 years are highly critical in the problems to be met by tanker

TABLE 7—EMPLOYMENT OF TOTAL UNITED STATES TANK SHIP FLEET BY AREAS (EXCLUDING MILITARY) AS OF SEPTEMBER 30, 1948

Ocean-going vessels 2,000 gross tons and over. (Source: U. S. Maritime Commission)

Area—	Private Fleet Employment			U. S. M. C. Fleet Employment			Total U. S. Fleet Employment			As per cent employment	Round-trip distances (nautical miles)
	No.	Gross tons	D.W.T.	No.	Gross tons	D.W.T.	No.	Gross tons	D.W.T.		
1. Nearby foreign—											
Canada	7	66,178	106,300	..	.....	.....	7	66,178	106,300	1.4	1,646
Mexico	3	25,342	38,200	..	.....	.....	3	25,342	38,200	0.5	1,044
West Indies, Bermuda & N. Coast of South America	58	604,081	981,200	..	.....	.....	58	604,081	981,200	13.3	3,798
Total	68	695,601	1,125,700	..	.....	.....	68	695,601	1,125,700	15.2	3,501
2. Overseas foreign—											
Transatlantic:											
Atlantic Europe and U. K.	7	66,781	107,100	..	.....	.....	7	66,781	107,100	1.5	7,448
Mediterranean	1	7,227	10,600	..	.....	.....	1	7,227	10,600	0.1	10,248
West Africa	1	9,925	15,900	..	.....	.....	1	9,925	15,900	0.2	6,670
Persian Gulf	25	266,858	430,800	..	.....	.....	25	266,858	430,800	5.8	17,028
Subtotal	34	350,791	564,400	..	.....	.....	34	350,791	564,400	7.6	14,791
South America:											
East Coast	4	38,826	61,400	..	.....	.....	4	38,826	61,400	0.9	9,524
West Coast	1	10,448	16,800	..	.....	.....	1	10,448	16,800	0.2	10,280
Subtotal	5	49,274	78,200	..	.....	.....	5	49,274	78,200	1.1	9,686
Total	39	400,065	642,600	..	.....	.....	39	400,065	642,600	8.7	14,170
3. Foreign to foreign—											
Persian Gulf—Canada	3	30,909	49,400	..	.....	.....	3	30,909	49,400	0.7	16,660
Persian Gulf—East Coast of South America	7	72,095	117,500	..	.....	.....	7	72,095	117,500	1.6	18,052
Persian Gulf—Atlantic Europe	11	111,955	182,700	..	.....	.....	11	111,955	182,700	2.5	13,754
Persian Gulf—Mediterranean	6	61,908	100,000	..	.....	.....	6	61,908	100,000	1.3	8,982
Persian Gulf—E. and S. Africa	4	41,785	66,400	..	.....	.....	4	41,785	66,400	0.9	10,422
Aruba—E. Coast of S. America	11	106,883	171,100	..	.....	.....	11	106,883	171,100	2.3	1,030
Caribbean Area	5	40,641	64,200	..	.....	.....	5	40,641	64,200	0.9	2,346
Other foreign—foreign	17	168,947	272,200	..	.....	.....	17	168,947	272,200	3.7	9,815
Total	64	635,123	1,023,500	..	.....	.....	64	635,123	1,023,500	13.9	9,815
4. Domestic—											
Atlantic Gulf	209	1,969,011	3,174,500	..	.....	.....	209	1,969,011	3,174,500	42.9	3,722
Pacific	28	238,387	374,000	..	.....	.....	28	238,387	374,000	5.1	1,802
Intercoastal	3	27,278	43,600	..	.....	.....	3	27,278	43,600	0.6	9,354
Hawaii	6	49,583	74,400	..	.....	.....	6	49,583	74,400	1.0	4,182
Puerto Rico	1	7,218	10,500	..	.....	.....	1	7,218	10,500	0.1	2,276
Total	247	2,291,477	3,677,000	..	.....	.....	247	2,291,477	3,677,000	49.7	3,599
Total active service	418	4,022,266	6,468,800	..	.....	.....	418	4,022,266	6,468,800	87.5	5,616
5. Laid-up vessels—											
Hudson River, N. Y.	.....	.....	.....	3	21,729	32,000	3	21,729	32,000	0.4	.....
James River, Va.	.....	.....	.....	5	36,198	55,400	5	36,198	55,400	0.8	.....
Suisun Bay, Cal.	.....	.....	.....	4	28,732	43,400	4	28,732	43,400	0.6	.....
Beaumont, Tex.	.....	.....	.....	3	9,786	12,600	3	9,786	12,600	0.2	.....
Wilmington, N. C.	.....	.....	.....	1	7,218	10,500	1	7,218	10,500	0.1	.....
Astoria, N. Y.	.....	.....	.....	1	7,218	10,600	1	7,218	10,600	0.1	.....
Subtotal	.....	.....	.....	17	110,881	164,500	17	110,881	164,500	2.2	.....
Temporarily inactive	53	431,719	675,700	6	54,844	86,700	59	486,563	762,400	10.3	.....
Total	53	431,719	675,700	23	165,725	251,200	76	597,444	926,900	12.5	.....
Grand total all vessels	471	4,453,985	7,144,500	23	165,725	251,200	494	4,619,710	7,395,700	100.0	.....

Cylindrical Plug design does not wedge



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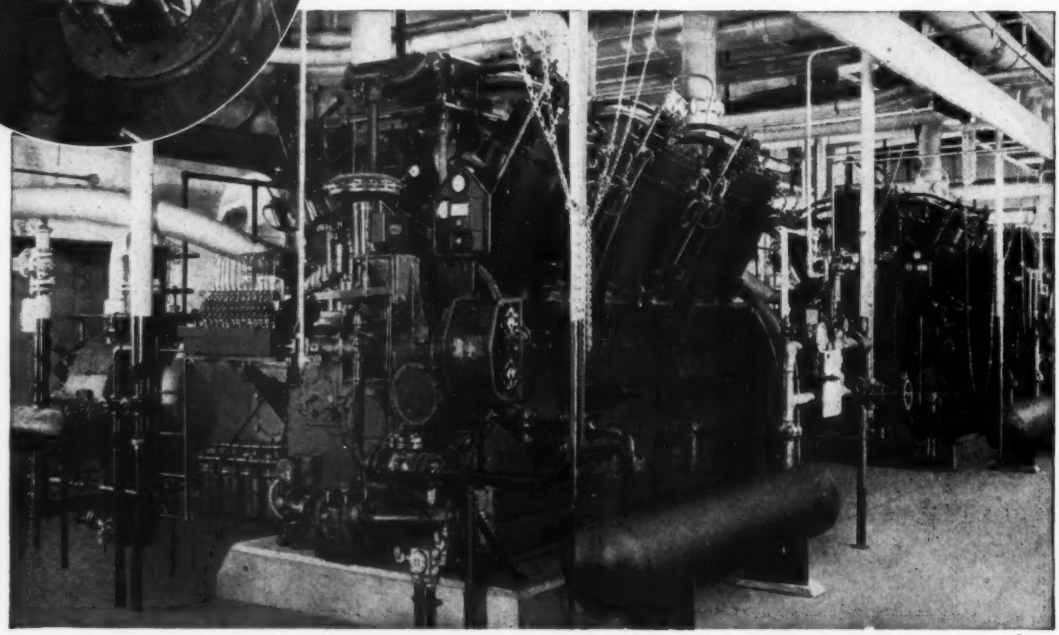

Five of the seven GMV's totaling 3,200 hp at the Pure Oil Toledo refinery. Cylinders show only .002" to .003" wear after four years of service. An eighth GMV has just been installed.

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TABLE 8 (A)—TANK SHIPS UNDER CONSTRUCTION OR ON ORDER AS OF OCT. 28, 1948, BY COUNTRIES CONSTRUCTING VESSELS

Ocean-going vessels 2,000 gross tons and over. (Source: U. S. Maritime Commission)

Country constructing vessels, country of registry	No. of vessels	D.W.T.
United States:		
United States	32	863,800
Panama	38	974,000
Total United States	70	1,837,800
United Kingdom:		
United States	2	49,000
United Kingdom	104	1,361,830
Sweden	4	55,100
Denmark	3	41,500
Norway	74	1,253,000
Panama	13	200,000
Argentina	6	108,850
Poland	2	22,000
Total, United Kingdom	208	3,091,280
Canada: Canada	1	6,500
Sweden:		
Sweden	16	263,000
Denmark	1	18,200
Norway	62	1,027,650
Argentina	3	40,500
Total, Sweden	82	1,349,350
Denmark:		
Denmark	7	112,400
France	2	31,000
Norway	12	189,800
Total, Denmark	21	333,200
Netherlands:		
Netherlands	3	34,100
France	1	3,650
Norway	6	96,000
Argentina	4	54,000
Total, Netherlands	14	187,750
France: France	13	191,200
Belgium:		
Belgium	2	29,100
Norway	3	49,500
Panama	3	49,500
Portugal	1	16,500
Total, Belgium	9	144,600
Norway: Norway	8	118,000
Spain:		
Spain	6	65,400
Portugal	2	20,000
Total Spain	8	85,400
Japan:		
United States	2	36,000
Norway	2	36,000
Total, Japan	4	72,000
Italy: Italy	2	36,000
Total	440	7,453,080

TABLE 8 (B)—TANK SHIPS UNDER CONSTRUCTION OR ON ORDER AS OF OCT. 28, 1948, BY COUNTRIES OF REGISTRY

Ocean-going vessels 2,000 gross tons and over. (Source: U. S. Maritime Commission)

Country of registry—	No. of vessels	D.W.T.
United States	36	948,800
United Kingdom	104	1,361,830
Canada	1	6,500
Sweden	20	318,100
Denmark	11	172,100
Netherlands	3	34,100
France	16	225,850
Belgium	2	29,100
Norway	167	2,769,950
Spain	6	65,400
Italy	2	36,000
Panama	54	1,223,500
Argentina	13	303,350
Poland	2	22,000
Portugal	3	36,500
Total	440	7,453,080

operators through the world and, particularly, the United States owners of tank-ship fleets. With the virtual completion of the United States Maritime Commission's ship-disposal program, the challenge and full responsibility for supplying the world's peacetime petroleum needs falls upon the private operators of world tank-ship fleets. In addition, there is also the consideration of military requirements necessitating long hauls and unusual operating conditions. Finally, the private tanker owners and operators are faced with the urgent need for long-term planning of necessary replacement, scrappage, and expansion programs to reduce the age-distribution distortions of their present fleets.

Acknowledgments

First, it is essential to express sincere thanks to every American tanker owner and operator who supplied a corrected individual tank-ship listing with estimates of changes during the last third of 1948.

Second, the author is indebted to the United States Maritime Commission, Division of Research, Col. Hugh D. Butler, director, and also the Vessel Records Branch. In addition, a number of companies have extended exceptional assistance. Among these one must mention the Standard Oil Co. (N.J.) and Overseas Tankship Corp.

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TABLE 9—ESTIMATED WORLD TANK SHIP FLEET FOR YEARS ENDING 1948 TO 1952
(Ocean-going vessels 2,000 gross tons and over)

	Cum. new construction from Sept. 1, 1948			World fleet at end of period: No allowance for scrappage of overage vessel			Full allowance for scrappage of vessels over 20 yr.		
	Actual		T2-SE-A1	Actual		T2-SE-A1	Actual		T2-SE-A1
4 mo.	No.	D.W.T.	Equiv.	No.	D.W.T.	Equiv.	No.	D.W.T.	Equiv.
1948	71	1,006,850	57.4	1,942	24,792,650	1,329.8	1,521	21,003,850	1,169.7
1949	174	2,869,480	169.0	2,045	26,655,260	1,441.4	1,592	22,528,180	1,266.2
1950	285	4,960,180	296.0	2,156	28,745,980	1,568.4	1,654	24,000,380	1,364.3
1951	393	6,707,380	394.7	2,264	30,493,180	1,667.1	1,713	25,166,480	1,436.3
1952	440	7,453,080	435.8	2,311	31,238,880	1,708.2	1,744	25,726,580	1,468.6

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World Supply Picture Brightens

(Continued from page 158)

refinery-building programs in the United States, working capacity will rise to 6,034,000 bbl. per day in 1949 as compared with 5,859,000 bbl. per day in 1948, an increase of 175,000 bbl. per day. Petroleum refineries in the United States have operated during the year at a very high capacity ratio of over 95 per cent, indicating the need of additional facilities to provide a safer working margin. Although complete factual data regarding expansion program after 1949 are not available, no serious bottleneck is expected in this connection. Most of the oil companies engaged in refining are carrying out long-range refining expansion in order to keep abreast of rising demand.

The foregoing outlook regarding supply and demand for the United States covering the coming 5 years has been predicated on the assumption that a recession or a war will not occur during the years 1949-1953, inclusive.

TABLE 3—GROWTH IN WORLD'S PETROLEUM SUPPLY AND DEMAND 1948-1953 INCLUSIVE
(Thousands of barrels daily)

Year—	Gross indigenous supplies incl. natural gasoline, benzol, etc. Bbl.	Increase versus previous year Bbl.	Per cent	Domestic demand† Bbl.	Increase versus previous year Bbl.	Per cent
United States						
1948	*5,900	...	...	*5,900	...	...
1949	6,080	180	3.1	6,200	300	5.1
1950	6,225	145	2.4	6,450	250	4.0
1951	6,390	165	2.7	6,650	200	3.1
1952	6,565	175	2.7	6,850	200	3.0
1953	6,740	175	2.7	7,050	200	2.9
Foreign (Excluding U.S.S.R. and Satellites)						
1948	*3,127	...	...	*2,922	...	...
1949	3,465	338	10.8	3,160	238	8.1
1950	3,780	315	9.1	3,381	221	7.0
1951	4,055	275	7.3	3,618	237	7.0
1952	4,340	285	7.0	3,871	253	7.0
1953	4,645	305	7.0	4,142	271	7.0
Total World (Excluding U.S.S.R. and Satellites)						
1948	*9,027	...	...	*8,822	...	...
1949	9,545	518	5.7	9,360	538	6.1
1950	10,005	460	4.8	9,831	471	5.0
1951	10,445	440	4.4	10,268	437	4.4
1952	10,905	460	4.4	10,721	453	4.4
1953	11,385	480	4.4	11,192	471	4.4

*Partly estimated. †Not including inventory increase.

Situation in Foreign Countries

During 1948 the rate of crude-oil production abroad increased substantially, rising from 2,554,000 bbl. per day in 1947 to 3,077,000 bbl. per day, an increase of 523,000 bbl. per day or 20 per cent. Table 1 shows that the larger part of the increase has been in the Eastern Hemisphere, particularly in the Near and Middle East, where the output rose from 833,000 bbl. per day to 1,120,000 bbl. per day or 34 per cent.

Demand for crude and products in foreign countries will, very likely, reach a level of 2,922,000 bbl. per day for 1943, exceeding all previous years as compared with 2,608,000 bbl. per day for 1947, a gain of 314,000 bbl. per day or 12 per cent. Table 2 indicates that more than one-half of this increase has been in countries of Europe participating in the Marshall plan where demand reached a level of 1,013,000 bbl. per day or 22 per cent over 1947.

For many years exports of crude and products from the United States filled the gap between available net supplies from foreign indigenous sources and domestic demand in countries abroad. As already pointed out, beginning with the year 1948 this condition has been reversed—foreign-produced supplies are now required to bridge the supply-demand gap in the United States. Accordingly, foreign crude resources are being developed in order to meet growing domestic demand in countries abroad and to provide for net exports.

Proposed plans for increasing crude productivity, construction of pipe lines, and expansion of refining facilities indicate that there will be sufficient total foreign indigenous supplies of raw materials to meet domestic demand and net exports to the United States. Total foreign indigenous supplies should rise from 3,127,000 bbl. per day in 1948 to 4,645,000 bbl. per day in 1953, or an average yearly increment of about 300,000 bbl. per day.

Domestic demand in countries abroad will continue to grow from 2,922,000 bbl. per day in 1948 to 4,142,000 bbl. per day in 1953, an average annual increment of 240,000 bbl. per day. The graph of world demand illustrates the large increase in volume and the faster rate of growth of the postwar demand as compared with prewar.

Demand Outlook Uncertain for Eastern Hemisphere

The per capita consumption of oil in Europe is only 57 gal. as compared

TABLE 2—WORLD DEMAND FOR PETROLEUM CRUDE AND PRODUCTS
(Excluding Russia and Satellite Countries)
(Thousands of barrels daily)

Areas—	1938 Bbl.	1938 % of total world	1946 Bbl.	1946 % of total world	1947 Bbl.	1947 % of total world	*1948 Bbl.	*1948 % of total world	*1948 % Inc. vs. 1947	1949 Bbl.	1949 % of total world	1953 Bbl.	1953 % of total world
United States	3,115	64	4,912	68	5,449	68	5,900	67	8	6,200	66	7,050	63
Other Western Hemisphere	464	9	832	12	947	12	1,001	11	6	1,057	12	1,431	13
Total western Hemisphere	3,579	73	5,744	80	6,396	80	6,901	78	8	7,257	78	8,481	76
Marshall plan—Europe	774	16	637	9	833	10	1,013	12	22	1,138	12	1,612	14
Other Eastern Hemisphere	533	11	765	11	828	10	908	10	10	965	10	1,099	10
Total Eastern Hemisphere	1,307	27	1,402	20	1,661	20	1,921	22	16	2,103	22	2,711	24
Total foreign	1,771	36	2,234	32	2,608	32	2,922	33	12	3,160	34	4,142	37
Total world	4,886	100	7,146	100	8,057	100	8,822	100	9	9,360	100	11,192	100

*Partly estimated.

with 625 gal. in the United States which would seem to indicate the possibility of a very large potential demand. However, an examination of the economy of Europe and other countries of Eastern Hemisphere indicates that there are limitations to the extent that many countries can support the importation and maintenance of a large number of present-day high-cost motor cars. The same is true regarding oil-burning equipment. Furthermore, retail prices of petroleum fuels are generally high due largely to import duties and sales taxes.

In some countries the consumption of motor fuel is controlled by consumer rationing. Furthermore, government approval is required generally abroad for the conversion from coal to oil. There are indications of a trend back to the use of coal in several countries. To conserve foreign exchange and bring about a more favorable balance of trade, most governments restrict the rate of imports of petroleum products through import licenses or quotas. Nearly all countries abroad must accomplish increasingly larger agricultural or industrial production. Also, larger export trade is necessary in order that their economy can support the importation of additional quantities of petroleum products and oil-consuming equipment.

Present regulations and measures restricting or retarding the use of petroleum products may be attributed largely to the fact that many countries abroad are in the midst of a postwar period of rehabilitation, together with economic and political readjustments. When and to what extent can these countries emerge from this period to one of economic and political stability? While reports indicate that good progress is being made in the postwar recovery of several countries particularly Western Europe, conditions generally are not considered good in many eastern countries.

Furthermore, many trade and currency problems are still to be solved. Most of the countries have yet to demonstrate conclusively that complete economic recovery and stable governments will be achieved in the near future. Europe has still to give assurance of becoming self-sustaining and independent of American aid. Under these conditions together with the tense international situation, the demand outlook today for petroleum products is uncertain for a large part of the Eastern Hemisphere. Therefore, it would seem advisable to review from time to time the petroleum-demand outlook in connection with the economic and political developments abroad.

Foreign Refining

Refining capacity of the Eastern Hemisphere is totally inadequate to meet its needs of finished products. Europe and the Mediterranean areas are especially in need of additional refining facilities for the following reasons:

1. Plants damaged or destroyed during the war.

2. Plants shut down during the war and are still under repair or reconstruction due to lack of materials or for other reasons.

3. Refineries of the Caribbean area must supply increasing quantities to meet own hemisphere's requirements including larger exports to the United States. Therefore, diminishing supplies are left for the Eastern Hemisphere.

4. Decline of imports of finished products from the United States.

5. Discontinuance of imports of finished products from Romania and Russia.

6. Increasing crude-oil production in the Near and Middle East necessitates the creation of new refining centers in or near the large consuming areas of Europe.

According to plans publicly announced, the petroleum industry will undertake extensive expansion of refining facilities in both Eastern and

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Western Hemispheres. A tabulation of the proposed additions and new plants indicates that the intake capacity of refineries of the Western Hemisphere outside the United States will rise from 1,600,000 bbl. per day in 1948 to 2,100,000 bbl. per day in 1953, and in the Eastern Hemisphere excluding U.S.S.R. and satellite countries from 1,500,000 bbl. per day in 1948 to 2,900,000 bbl. per day in 1953.

Runs to stills in European refineries are larger today than a year ago, reflecting primarily the going on stream of certain war-damaged plants and the trend to operate for maximum fuel-oil yields. On the other hand, the closing of the Haifa, Palestine, refinery with a capacity of 83,000 bbl. per day has placed an additional load on plants located in the Persian Gulf, the Caribbean area, and Europe. Early resumption of operation of this plant is hoped for in order to improve the supply situation of the Mediterranean area. The refinery bottleneck of the Eastern Hemisphere west of Suez is not expected to be completely eliminated for several years. Present-day shortages of steel together with unsettled political conditions and problems of financing are factors delaying the construction of much needed additional crude processing facilities in Europe and the Mediterranean area.

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Shifts in International Flow of Oil

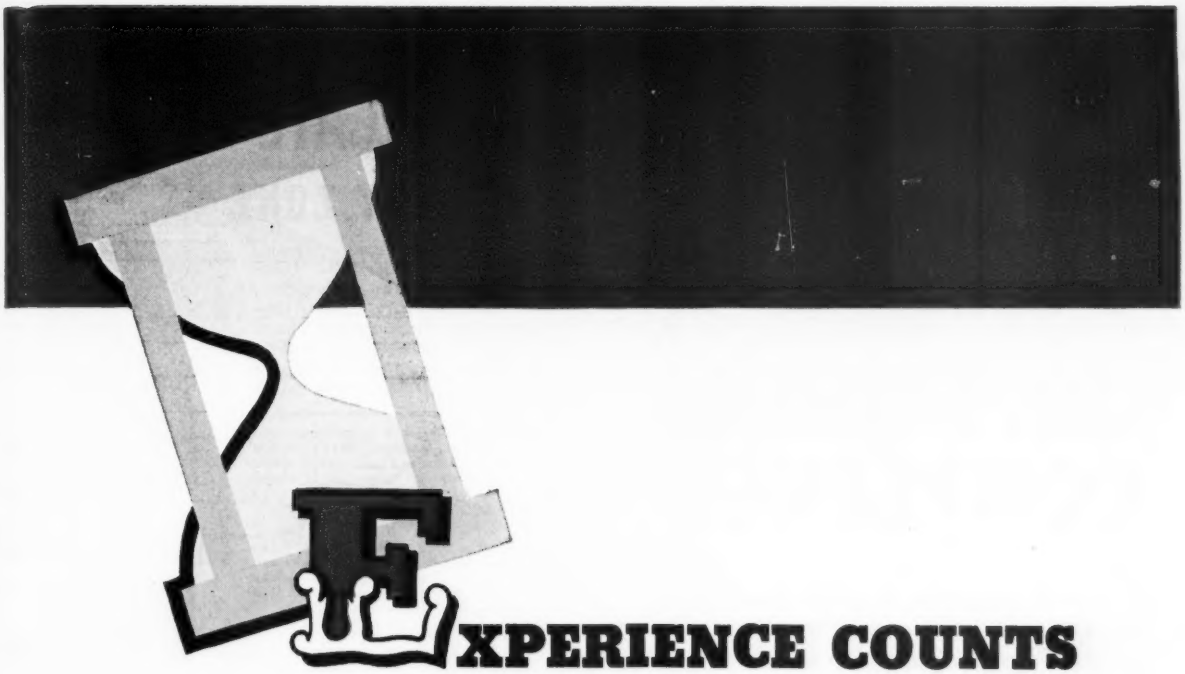
World supply and demand outlook indicates a number of important changes in the position of supply versus demand and also shifts in the international flow of petroleum products. One of the important changes already observed is the reversal in position of the United States from a net exporter to a net importer of petroleum supplies. With reference to this situation, substantial crude-oil production has been developed in South America due largely to the foresight and courage of the American oil industry. Therefore, the United States is fortunate in having a nearby source of crude to meet its indigenous supply deficiency.

However, it must be realized that South America as a source of future supply to meet possible large shortages in the United States is contingent in turn upon the development of crude-oil resources in the Middle East together with the expansion of refining facilities in Europe. Middle East crude-production capacity must be increased, pipe-line transportation provided, and refining facilities expanded in order to reduce the drain on South America by countries of the Eastern Hemisphere.

Both the Eastern and Western Hemisphere will become for the most part self-sufficient within the next 5 years. Shipments from the Western Hemisphere to the Eastern Hemisphere will decline and movement will be confined largely to lubricants and specialty products.

The supply-demand picture for the entire Western Hemisphere including the United States supports the prevailing opinion that the production of raw materials within the Western Hemisphere may be adequate to meet total requirements and that the importation into the United States of crude oil from the Middle East may not be statistically required to balance demand. However, looking beyond the next 5 years, if production within the Western Hemisphere does not provide for sufficient supplies to meet total requirements, imports from the Middle East would be needed to balance demand. Comparatively small quantities of crosshauling between the Eastern and Western Hemispheres will continue due to contractural obligations and movement of supplies for military and governmental purposes.

As already observed, the proposed greatly accelerated Middle East crude-oil production, together with the expansion of refining facilities in



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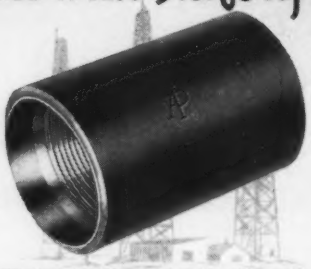

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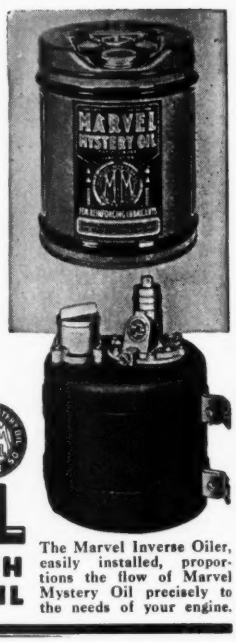

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the Eastern Hemisphere will cause a displacement of shipments from the Caribbean area to Europe. A substantial part of the displaced shipments to Europe will be needed in increasingly larger quantities to meet the deficit in the United States.

Managers of marine operating departments of several oil companies have announced that the industry tanker-tonnage position today has greatly improved over that of a year ago. The postwar adjustment difficulties are apparently over, with the outlook today much more optimistic. Sufficient tankers are expected to be available over the next few years to meet world-wide transportation requirements, provided there are no great delays in the completion of proposed Middle East pipe lines.

These changes in the relationship of supply versus demand and also the shift in the international flow of oil are all dependent to a large extent on the development of producing capacity in the Middle East, laying of pipe lines, and expansion of refineries. The consummation of the proposed plans for the expansion of producing, transportation, and refining facilities in the Eastern Hemisphere will depend largely upon the availability of equipment and materials. Foreign exchange controls, European recovery program, import-export controls, quality of products, tanker situation, and lack of refining facilities are also some of the factors affecting international flow of petroleum. The present-day economic and political instability in many countries of the Eastern Hemisphere together with the tense international relations are further contributing factors retarding the carrying out of expansion programs.

Conclusions

The substantial improvement in the world supply-demand situation today as compared with a year ago reflects the remarkable progress, notwithstanding many delaying factors, achieved by the petroleum industry in its world-wide program to increase producing capacity and to expand refining, transportation and storage facilities.

However, the world supply problem is not yet entirely solved and the industry must continue its efforts to build up safe reserves and at the same time to meet increasing world demand for oil which is so essential for the maintenance and improvement of the standard of living throughout the world. Its past record of achievements leaves little doubt that the industry can successfully meet this great task provided it can continue to operate in an economy of free private enterprise, with adequate incentives, and minimum government controls.

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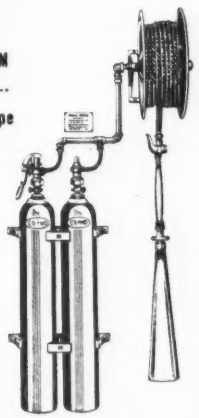

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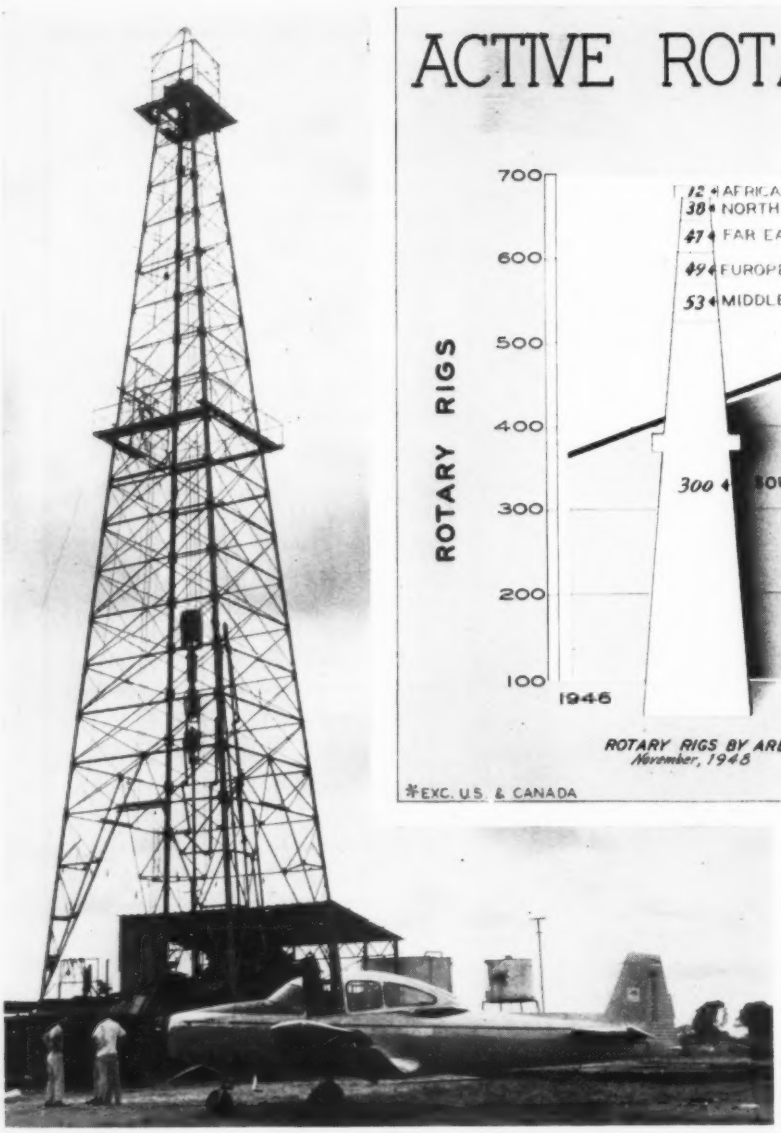

Socony-Vacuum plane before drilling rig No. 4 in San Silvestre area, State of Barenas, Venezuela. This plane is often used in making contacts with field operations when roads become impassable

499 Rotary Rigs Operating Outside U.S., Canada, U.S.S.R.

by Dahl M. Duff

A TOTAL of 499 rotary rigs are now in operation in all areas throughout the world outside the United States, Canada, Russia and Russian-dominated countries, where an accurate count is possible. The figure represents a gain of some 60 rigs or about 13 per cent over rigs running in the same areas a year ago. Unofficial estimates, based largely on prewar operations, place the total rigs in Russia and Russian-dominated countries at about 600. In the United States rotary rigs in operation number 2,422. Another 80 are running in Canada which is considered a part of domestic operations by most companies. Thus, the grand total of rigs in all parts of the world, including the Russian estimates, is placed at slightly over 3,600.

In the areas outside the United States and not including Canada and the Russian countries, the rig total of 499 represents an increase of approximately 31 per cent over the total operating in late 1946. Furthermore, expansion programs and equipment orders indicate more than 180 more rigs will be added to the total over the next year or two. If these programs are carried out, the total would rise to 685 rigs, a 37 per cent gain over the number now running. Some of these existing rigs, however, are for replacement of existing equipment.

The steady upward trend in rigs running in foreign areas reflects the tremendous world-wide search for oil which has been under way since resumption of operations became possible in many countries with the end of the war. It is indicative of the desire of operating companies for added reserves and corresponds to the increasing number of rigs running in the United States since 1945.

The country-by-country tabulation of rigs running (see accompanying table) includes many isolated areas where one or two rigs have been placed in operation on strictly wildcat prospects following structural in-

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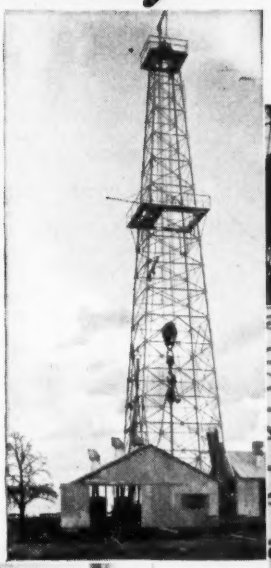

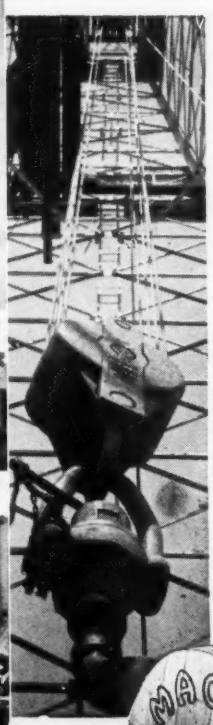

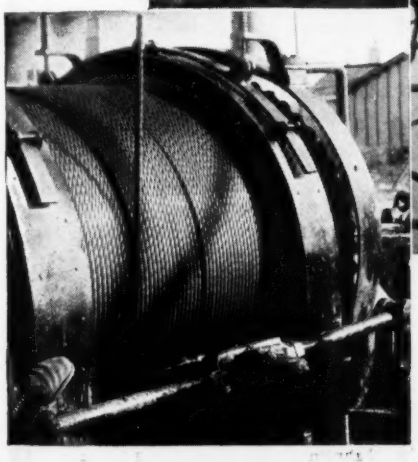

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Several areas—among them Peru, North Africa, and the Netherlands East Indies, or Indonesia—hold the promise of a marked upturn in drilling activity in the next year or two. Much activity in Peru is anticipated if the government provides favorable conditions for such exploration. Several discoveries since the war in North Africa have attracted considerable attention, and more drilling is forecast. In the East Indies, a prospective increase of 25 rigs is listed as against 15 now running. This increase assumes a settlement of the presently disturbed political conditions in these countries.

Canada is another area slated for a large increase in drilling. Development work and further wildcatting, mostly in northern Alberta, is expected to add an additional 100 rigs to Canadian operations within a year or more. Trinidad is expected to increase its operating rigs from 22 to 37.

The figures on rigs running bear out the importance of South America and particularly Venezuela. Of the total 499 rigs in foreign areas, 300, or about 60 per cent, are in South America. Of the indicated increase of 186 rigs for all areas, 87, or about 47 per

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ROTARY RIGS OPERATING THROUGHOUT WORLD

NORTH AMERICA
(Excludes U. S. and Canada)

Country—	Nov. 1946	Nov. 1947	Nov. 1948	Prospective inc.
Alaska	1	2	2	2
Bahama Islands	1	...	...	...
Cuba	2	...	1	...
Dominican Republic	1	...	...	...
Haiti	2	1	...	...
Mexico	17	22	34	6
Nicaragua	...	1	...	...
Panama	...	1	1	...
North America	24	27	38	8

SOUTH AMERICA

Argentina	43	52	56	40
Bolivia	2	2	2	2
Brazil	5	5	5	2
Chile	2	4	4	2
Colombia	33	29	27	...
Ecuador	10	13	13	3
Paraguay	...	1	2	...
Peru	21	20	17	4
Trinidad	19	21	22	15
Venezuela	125	140	152	19
Eastern	87	75	78	4
Central	...	14	8	1
Western	38	51	66	14
South America	260	287	300	87

EUROPE
(Excluding Russian-controlled countries and Germany)

England	5	11	9	4
Denmark	...	1	2	...
France	16	15	18	1
Italy	1	5	11	4
Netherlands	4	6	6	2
Spain	2	1	3	2
Europe	28	39	49	13

AFRICA
(Excluding Egypt)

Algeria	...	2	2	2
Ethiopia	...	...	1	...
French Equitorial Africa	...	1	1	1
Morocco	4	6	6	...
Nigeria	...	...	...	1
Tunisia	...	1	2	...
Africa	4	10	12	4

MIDDLE EAST

Bahrein	...	2	2	1
Cyprus	...	...	...	2
Egypt	10	11	8	3
Iran	9	7	9	6
Iraq	1	3	6	6
Kuwait	...	5	9	3
Palestine	...	1	...	1
Qatar	...	2	2	4
Trans-Jordan	...	...	...	3
Saudi Arabia	5	7	11	6
Syria and Lebanon	...	1	4	2
Turkey	...	1	2	2
Middle East	25	40	53	39

FAR EAST

Australia	...	1	2	1
China	2	3	3	1
Burma	25	1	2	2
East Indies		8	15	25
Philippines		1	1	0
India	8	12	12	5
Japan	...	9	9	...
New Guinea	2	2	3	1
Far East	37	37	47	35
Total	378	440	499	186

cent, are scheduled for South America.

Venezuela Shows Expansion

A continued steady expansion in drilling in Venezuela also is indicated. This is taking place mainly in Western Venezuela where the operating companies are now stepping up work in an effort to extend the prolific Cretaceous limestone production which has been found in three fields west of Lake Maracaibo. Of 152 rigs in Venezuela, 66 are running in Western Venezuela with 14 more expected to be added in this section during coming months.

Of interest is the correlation between rigs running and oil production. These figures show clearly the high per-well production obtained from operations in the Middle East.

In the United States, data show that approximately 2,500 bbl. of crude daily is being produced for each rig running. The comparable figure for all the foreign areas represented by the 499 rigs is approximately 5,700 bbl. daily. South America also produces about 5,700 bbl. daily per operating rig.

In the Middle East, however, where high per-well flows are the rule, the figure approximates 19,500 bbl. daily for each operating rig. It is likely that this will be even greater in the future when production-expansion plans, now largely held back by a lack of transportation, are realized.

Reports indicate that some 39 rigs will be added to the 53 now operating in the various Middle East countries, including Egypt. These rigs will go not only to established areas such as Saudi Arabia, Iran, and Kuwait, but also to the various wildcatting operations being carried out. One of the most remarkable developments in the oil industry today, particularly when considered by United States standards, is taking place in Kuwait. Here, with nine rigs presently running, production has been brought to more than 200,000 bbl. daily since the end of the war. Three additional rigs are planned, and a production increase to 400,000 bbl. daily.

About 50 rigs are now operating in Western Europe where a thorough search is on for every possible barrel of indigenous production. France has a reported 18 rigs running, and Italy 11. Some are of the lighter type.

The table does not include Germany, but information indicates 18 rigs are in operation in this country, 12 of which are in the western sectors. In the countries behind the so-called iron curtain, rigs running as roughly estimated as follows: Romania 54, Austria 10, Hungary 8, Poland 5, Czechoslovakia 6.

Any estimate of the number of rigs now running in Russia is admittedly subject to considerable error because of the absence of any official data. However, the total is believed to be in the neighborhood of 500. These totals for Russia and Russian-dominated countries have little practical significance since their production, consumption, and equipment production are all within the countries themselves.

In the Far East, the major drilling activity is in the East Indies. Operations in India are showing some increase, and Burma is expected to step up its activity as reconstruction of war damage proceeds. Wildcatting is under way in Australia and the Philippines, and work is continuing in favorable areas in New Guinea. Japan is said to have nine rigs running, using obsolete equipment badly in need of replacement.

OIT Raises Fourth-Quarter Export Quota for Fuel Oil

WASHINGTON.—The Office of International Trade has raised its fourth-quarter export quota for residual fuel oil from 1,450,000 to 2,450,000 bbl., assigning 726,000 bbl. from the increase to six countries, putting 24,000 bbl. aside for special projects and placing 250,000 bbl. in the undistributed reserve.

The OIT announced that the allocations included 25,000 bbl. for Chile, 200,000 for China, 45,000 for Nicaragua, 260,000 for Cuba, 64,000 for Mexico and 133,000 for the Philippines.

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PARAFFIN SCRAPERS
SCRAPE AS THEY ROTATE AS THEY RECIPROCATE

Refining Saudi Arabia Crudes

(Continued from page 161)

tane number, which is well above the values usually demanded for high-speed diesel engines. Both the light and heavy straightrun naphthas are low in sulfur, which tends to concentrate in the heavier fractions, 2.74 per cent being present in the residuum.

In the primary distillation of the Arabian crude mixtures the degree

TABLE 6—ACID TREATMENT OF 12 PER CENT KEROSINE CUT

	Raw stock	Treated product
Acid treating—		
Acid strength, per cent H_2SO_4		98.0
Acid dosage, lb. per bbl.		20
Number of dumps (of 10 lb. each)		2
Temperature of treating, °F.		110
Tests:		
Gravity, °A.P.I.	45.8	46.4
Flash, Pensky-Martens, °F.	145	150
Color, Saybolt	+30	+30
Sulfur, lamp, per cent	0.097	0.022
Doctor	Pos.	Neg.
Corrosion, copper strip at 150° F.	O.K.	O.K.
Burning test—24 hours:		
Max. chg. flame ht., in.	1/16	1/16
Max. chg. flame width, in.	1/16	1/16
Mushroom formation	Slight	Slight
Wick incrustation	Char., granular	Char., soft granular
Final condition chimney	Hy. white and brown	Lt. white and brown
I.P.T. smoke point, mm.	25	30
Smoke tendency, mm.	43	53
Distillation:		
I.b.p., °F.	358	368
5 per cent	380	380
10 per cent	384	384
20 per cent	390	390
30 per cent	396	394
40 per cent	400	398
50 per cent	406	404
60 per cent	410	408
70 per cent	418	416
80 per cent	421	424
90 per cent	428	436
95 per cent	448	444
End point	464	460
Per cent recovery	98.5	98.5
Per cent res.	1.0	1.0
Per cent loss	0.5	0.5

TABLE 7—PROPERTIES OF FEED, OPERATING CONDITIONS AND YIELDS

Feed:	Run A	Run B	Run C	Run D
Gravity, °A.P.I.	54.3	53.1	53.3	56.9
Sulfur, lamp	....	.039	.043	.057
R.v.p., lb.	1.0	0.8	0.6	3.0
Octane,, motor method, clear	28.5	28.0	27.5	32.7
+1 cc. TEL	44.4	43.8	44.0	46.7
+3 cc. TEL	57.6	56.5	57.5	58.5
Distillation:				
I.b.p., °F.	218	216	220	142
10 per cent	245	248	248	142
50 per cent	292	306	304	286
70 per cent	320	338	332	318
90 per cent	351	384	368	350
End point	408	432	416	410
Per cent rec.	98.5	98.0	98.0	99.0
Per cent res.	1.0	1.5	1.5	0.5
Per cent loss	0.5	0.5	0.5	0.5
Operating conditions:				
Rates charge, b.p.d.	7,332	7,400	7,250	8,318
Pressures, psig.:				
Heater inlet	932	941	1,098	1,215
Heater outlet	453	466	717	715
Flash fractionator	172	177	....	187
Stabilizer	150	135	143	130
Temperature, °F.:				
Heater inlet	354	338	254	310
Heater outlet	1,011	1,031	1,014	989
Flash fractionator inlet	683	665	676	675
Flash fractionator top	460	447	446	460
Flash fractionator bottom	660	651	621	....
Yields, liquid volume, per cent:				
Reformed naphtha, 7 lb. R.v.p.	84.63	75.28	76.69	87.29
Reformer tar	1.73	4.02	5.70	1.17
Gas (std. bbl.)*	12.39	18.74	15.80	10.15
Loss	1.25	1.96	1.81	1.39
Total	100.0	100.00	100.00	100.00

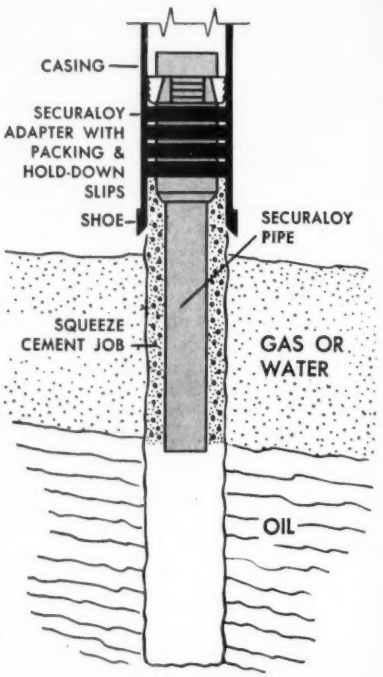
*One standard barrel = 6,400,000 B.t.u.

USE OF SECURALOY SOLVES MANY PRODUCTION PROBLEMS

Securaloy pipe, which may be removed with chemicals or a drilling bit, is being used to solve many "difficult" production problems, such as correcting gas-oil ratios, water shutoffs and plug backs.

CORRECTING GAS-OIL RATIOS

This method is similar to that used in the case history shown on the opposite page except that the Securaloy pipe extends through the gas zone to the top of the oil zone.



Securaloy set on top of producing zone

This method is used where the entire oil zone can be produced from open hole and where it is not necessary to confine the oil production to selective strata. The hole through the oil zone is first filled with gravel. Securaloy pipe is run and squeeze cemented in position. When the cement has set, Securaloy cementing shoe and gravel are cleaned out and well is ready for production, with gas or water successfully under control.

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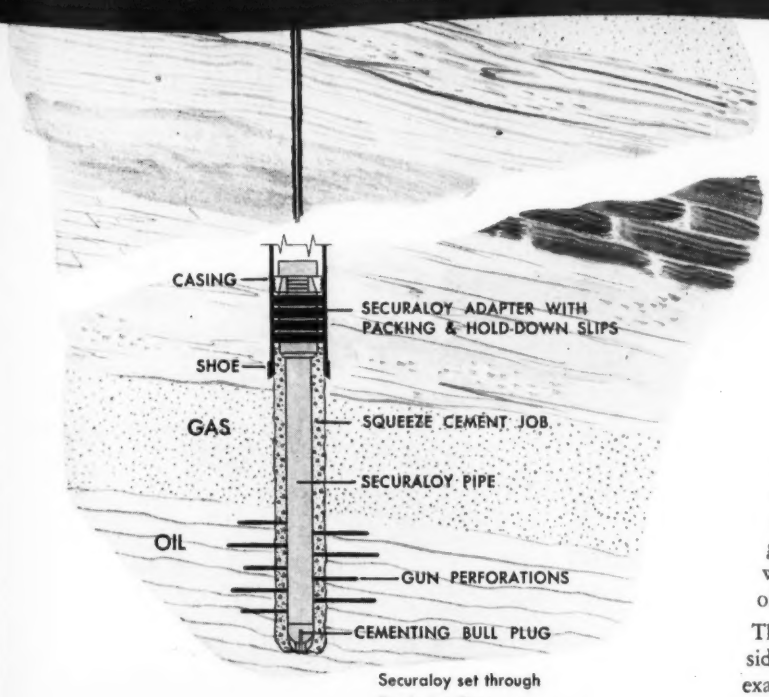
Branches in all of the major producing areas
Export Office: Chanin Building, New York City

LOCATION: Texas
GAS-OIL RATIO: 300 to 1
PRODUCTION: 5-6 barrels per day on pump
QUESTION: How to increase production and lower gas-oil ratio by a simple and satisfactory remedial method

Too much gas—Too little oil?



Securaloy set through Producing Zone

When a Texas operator found his gas-oil ratio too high and production way down he determined that the positive way to correct this situation was to use Securaloy. You, too, can profit by using Securaloy to solve your gas-oil ratio problems.

This operator first tried a plastic squeeze job, but the well still made only 6 barrels per day. Then a cement squeeze job was performed, with the entire open hole left full of cement and then drilled out. This proved unsuccessful too!

Finally, the operator cemented Securaloy pipe through the gas-oil sands, as shown. Selective strata were gun perforated and acidized. The well was then completed for 80 barrels of oil per day with a 40 to 1 gas-oil ratio!

This same remedial method is now considered standard practice . . . Another example of the application of Securaloy to solve your production problems.

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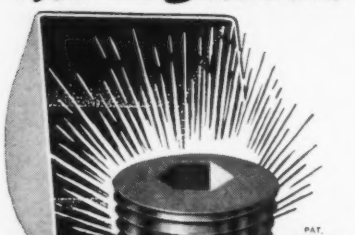

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of corrosion encountered depends upon whether unstabilized or stabilized crude freed of H_2S is run. The stills at the Ras Tanura refinery were designed for stabilized crude, and operation with unstabilized charge resulted in accelerated corrosion throughout heater coils, transfer lines, and the flash zone of the fractionating column. When carbon-steel furnace tubes reach minimum safe operating thickness they are replaced with those of 5 per cent chromium steel. Carbon-steel linings have been installed in the flash zones of the fractionating columns.

TABLE 8—PROPERTIES OF REFORMED PRODUCTS

(Liquid volume, per cent)

	Run A	Run B	Run C	Run D
Gas:				
Uncond. (std. bbl.)*	0.05	0.07	0.08	0.02
Methane (std. bbl.)*	1.14	1.88	1.55	0.77
Ethylene (std. bbl.)*	1.09	1.54	0.90	0.66
Ethane (std. bbl.)*	2.41	3.53	3.06	1.82
Propylene	5.40	6.79	4.96	3.79
Propane	4.32	6.63	6.52	4.01
Isobutane	0.41	0.68	0.59	0.54
Butylenes	1.75	3.27	2.52	1.63
n-Butane	0.82	1.13	1.20	0.92
C_5 Hyds.	0.44	0.19	0.26	0.10
C_6 Hyds.	0.15	0.06	0.29	0.03
Naphtha, 7-lb. R.v.p.	84.63	75.28	76.69	87.29
Tar	1.73	4.02	5.70	1.17
Total	104.34	105.07	104.28	102.75
Reformed naphtha (unsweetened):				
Gravity, °A.P.I.	55.9	54.2	56.0	57.3
Sulfur, lamp, per cent	.025	.025	.030	.034
R.v.p., lb.	7.0	6.4	4.9	6.4
Octane, A.S.T.M. motor method, clear	63.1	67.3	67.7	62.5
+1 cc. TEL	....	....	....	....
+3 cc. TEL	77.4	79.6	79.6	75.9
A.S.T.M. gum, mg.	1	....	1	....
Copper strip corrosion at 150° F.	O.K.	O.K.	O.K.	....
Distillation:				
I.b.p., °F.	99	99	104	104
10 per cent	179	160	156	156
50 per cent	273	274	266	264
70 per cent	303	311	304	306
90 per cent	350	363	350	350
End point	408	423	404	408
Per cent rec.	98.5	98.0	98.5	98.0
Per cent res.	1.0	1.0	1.0	1.5
Per cent loss	0.5	1.0	0.5	0.0
Tar (unstripped):				
Gravity, °A.P.I.	19.5	19.5	26.0	19.1
Sulfur, per cent	....	....	.097	....
Flash, Pensky-Martens, °F.	75	below 82	below 80	below 90
Vis. S.S.U. at 100° F.	59.0	50.9	36.3	....
Vis. S.S.U. at 122° F.	47.5	43.3	33.8	55.8
Pour point, °F.	—20	—20	below 25	....
Distillation:				
I.b.p., °F.	260	326	200	224
10 per cent	388	404	376	346
20 per cent	460	447	402	416
50 per cent	587	555	474	626
70 per cent	660	648	560	680
90 per cent	712	703	662	....
End point	750	....	724	....
Per cent rec.	98.5	....	97.5	....
Per cent res.	1.5	....	2.5	....
Per cent loss	0	....	0.0	....

*One standard barrel = 6,400,000 B.t.u.

TABLE 9—LABORATORY VACUUM DISTILLATION EVALUATION OF ARABIAN CRUDE OIL* FOR LUBRICATING-OIL MANUFACTURE

Cut points on crude	Corrected vol. % basis crude	Vapor temp., °F.	Pressure mm.	Gravity °A.P.I.	Flash COC, °F.	S.U. viscosities at 100° F.	S.U. viscosities at 150° F.	S.U. viscosities at 210° F.	Color N.P.A.
55-52.28	2.72	315	10	35.8	240	...	...	...	1
52.28-49.53	2.75	327	10	35.2	255	...	...	...	1¼
49.52-46.81	2.72	347	10	34.2	270	...	...	...	1½
46.81-44.09	2.72	364	10	33.4	290	43.7	36.3	...	1½
44.09-41.37	2.72	384	10	32.1	305	47.3	37.4	...	1¾
41.37-38.65	2.72	401	10	30.6	320	52.0	39.4	...	1¾
38.65-35.90	2.75	425	10	29.3	335	58.7	41.4	...	2
35.90-33.18	2.72	444	10	28.2	350	68.4	44.8	...	2½
33.18-30.42	2.76	397	1.6	26.9	365	85.1	48.6	...	3
30.42-27.70	2.72	416	1.5	26.1	400	100.5	54.9	...	3¼
27.70-24.91	2.79	440	1.5	24.7	425	...	64.9	42.6	4
24.91-22.12	2.79	466	1.2	23.5	450	...	80.6	46.9	4¼
22.12-19.37	2.75	496	1.2	21.9	470	...	108.5	53.5	5¾
19.37-16.55	2.82	...	...	20.9	495	...	160.0	64.2	7
Tests on residua	19.37	...	...	11.6	575	...	...	585	...
	16.55	...	...	10.7	605	...	...	980	...

*Foster Wheeler Engineering Corp.

Bahrein Petroleum Co. formerly charged stabilized Arabian crude alone or mixed with Bahrein crude but now charges considerable quantities of unstabilized Arabian crude. This refinery on Bahrein Island in the Persian Gulf has extensive refining facilities. It has modern crude-fractionation units, thermal cracking plants for converting residuum to motor fuel, catalytic cracking plants for producing gasoline of increased octane rating, auxiliary plants for processing cracked gases, a sulfur dioxide solvent extraction plant, and an asphalt-producing unit. The Ras Tanura refinery of Arabian American Oil Co. charges unstabilized crude and has such basic refining units as those for primary fractionation of crude and thermal reforming of naphthas. Single-stage caustic washing and lead sulfide sweetening are employed for treating naphtha and kerosine.

Based upon the experiences of Bahrein Petroleum Co. in handling stabilized mixtures of Bahrein and Arabian crudes, the following may be considered as typical crude unit corrosion. Nominal, mild corrosion rates are to be expected when using carbon steel equipment throughout the unit. The majority of the heater corrosion will be encountered in the outlet coils of the radiant section, Bahrein having experienced a maximum of 0.01 in. per 1,000 hours. At outlet temperatures of 650° F. the heater transfer piping of ½-in. wall thickness lasted approximately 8 years. The majority of tower corro-

TABLE 10—PRODUCING S.A.E.-10 OIL AND SOLVENT REFINED BRIGHT STOCK

Refining treatment—	Waxy neutral stock	S.A.E.-10 finished oil*
Per cent crude	15.57	9.8
Gravity, °A.P.I.	25.0	28.5
Flash, COC, °F.	420	410
S.U. vis. at 100° F.	145.9	148.2
S.U. vis. at 210° F.	42.4	42.9
Color	1¼ TR	1½ NPA
Conradson carbon residue, per cent	0.09	0.02
Pour test, °F.	85	—5
Vis.-gravity const.	0.835	.825
Viscosity index	....	95.6
Sulfur, per cent	....	1.25
Neutralization No.	....	0.08
Corrosion, CS/212° F.	....	Neg.

Refining treatment—	Bright stock residuum	Finished solvent refined bright stock†
Per cent crude	19.1	6.5
Gravity, °A.P.I.	12.3	25.5
Flash, COC, °F.	570	550
S.U. vis. at 100° F.	....	1,706
S.U. vis. at 210° F.	557	122
Color, Tag. Rob.	Black	1
Conradson carbon residue, per cent	13.8	0.84
Pour test, °F.	....	10
Vis.-gravity const.	0.908	0.817
Viscosity index	....	98.8
Sulfur, per cent	....	1.22
Neutralization No.	....	0.08

*Furfural refined, M.E.K.-beznol dewaxed and filtered. †Deasphalted, furfural refined, M.E.K.-benzol dewaxed and filtered.

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sion occurred in the flash zone and the first three trays above it. It is desirable to install a "wear plate" in the flash zone to protect the shell. Steel plates and cast-iron bubble caps are used in the column. Acid corrosion may be experienced on the top tray from the action of hydrolyzed salts and condensed steam (due to the momentary condensing action of the cold reflux). This can be minimized by the introduction of ammonia into the tower at a rate of approximately 1 lb. per 1,000 bbl. of crude. Chemical neutralization of acidic constituents has been limited to this ammonia injection into the fractionating tower.

Kerosine Manufacture

A standard white kerosine can be made from Arabian crude by taking a narrow cut and applying only a sweetening treatment with lead sulfide. For this product about 15 per cent of the crude can be taken as a kerosine cut having 0.1 per cent sulfur, 130° F. flash point, and 300 thermoviscosity. Such a kerosine is suitable for heating and cooking but would be considered as second-grade lamp oil. A maximum kerosine production of 22 per cent can be obtained from the crude oil. It would have a sulfur content of 0.2 per cent and an end boiling point of 525° F. Solvent extraction of this product can produce a premium-quality illuminating oil.

Table 6 indicates the effect of a laboratory-scale sulfuric acid treatment in improving the quality of a raw kerosine distillate, constituting 12 per cent of the crude oil. Some of the principal effects to be noted after using 20 lb. of sulfuric acid per barrel at 110° F. are reduction of sulfur from 0.097 to 0.022 per cent, negative doctor test, and improvement in both the I.P.T. smoke point and smoke tendency. The treated product also showed a comparatively small reduction in flame size in a 24-hour burning test with improvement in the condition of both wick and chimney. There is no material change in the distillation points. No rerunning was necessary after the acid treatment.

TABLE 11 — PRODUCING 70-VISCOSITY NEUTRAL OIL, S.A.E.-20 OIL AND CYLINDER STOCK

Refining treatment—	Light wax distillate	Finished 70 viscosity, neutral oil*
Per cent crude	7.86	6.5
Gravity, °A.P.I.	27.7	32
Flash, COC, °F.	360	370
S.U. vis. at 100° F.	73	73.3
S.U. vis. at 210° F.	36	36.3
Color, A.S.T.M.	2½	1+
Conradson carbon residue, per cent	.01	...
Pour test, °F.	60	—15
Viscosity index	...	88.5
Vis.-gravity const.	0.858	0.830
Sulfur, per cent	...	0.98
Neutralization No.	...	0.03

Refining treatment—	Heavy waxy neutral stock	S.A.E.-20 finished oil*
Per cent crude	12.25	5.1
Gravity, °A.P.I.	22.2	27.1
Flash, COC, °F.	455	465
S.U. vis. at 100° F.	359	295
S.U. vis. at 210° F.	53	51.9
Color	½ Tag. Rob.	1½ NPA
Conradson carbon residue, per cent	0.41	0.07
Pour test, °F.	95	—10
Viscosity index	....	96.0
Vis.-gravity const.	0.865	...
Sulfur, per cent	....	1.08
Neutralization No.	....	0.06

Refining treatment—	Heavy residuum	Finished cylinder stock†
Per cent crude	14.9	7.4
Gravity, °A.P.I.	10.3	18.5
Flash, COC, °F.	610	600
S.U. vis. at 100° F.	....	5,326
S.U. vis. at 210° F.	138 Furol	202
Color, Tag. Rob.	....	3/8
Conradson carbon residue, per cent	....	3.1
Pour test, °F.	....	15
Viscosity index	....	76.5
Vis.-gravity const.	....	0.867
Sulfur, per cent	....	2.59
Neutralization No.	....	0.20

*Furfural refined, M.E.K.-benzol dewaxed and filtered. †Deasphalted and M.E.K.-benzol dewaxed.

TABLE 12

Yields, vol. per cent—	Producing 6.0° A.P.I. tar
Charge:	
16.8° A.P.I. Arabian resid.	100.0
Products:	
Dry gas, C_3 and lighter (wt. %)	7.7
Naphtha, total C_4 retention and 250° F. 50 per cent point	40.0
Cracked tar	55.4
Products:	
Naphtha, debutanized, total pentane retention 320° F. 90 per cent point (rec.)	29.4
Cracked tar	57.6

Naphtha Reforming

At the Ras Tanura refinery a low-octane heavy naphtha constituting 17 per cent of the crude oil charged is subjected to thermal reforming. This product corresponds to the heavy gasoline shown in the first column under "Maximum Kerosine by Lead Sulfide Treating" in Table 5. To show the effect of varying severity in reforming this naphtha, four runs were made in U.O.P. thermal reforming units having Equiflux heaters and Gray clay towers. The clay treatment plus a small gum-inhibitor dosage assures a stable gasoline for storing and marketing in the hot areas of the Middle East. Tables 7 and 8 summarize the principal data contained in four commercial runs. The highest A.S.T.M. motor method octane number of 67.7 was obtained in run "C" in which the charging rate per day was 7,250 bbl., the heater outlet temperature was 1,014° F., and the pressure 717 psi. These conditions comprised the highest outlet pressure, the lowest feed rate and a moderately high temperature. By increasing the temperature to 1,040°-1,050° F., a 74-A.S.T.M. motor-method octane-number gasoline can be produced.

In the U.O.P. reforming units in both Bahrein and Ras Tanura refineries the heater tubes contain 2.25 per cent chromium and 1 per cent molybdenum. The molybdenum is added to increase the creep strength of the tubes. Headers contain 4-6 per cent chromium and 0.5 per cent molybdenum; the transfer line is of the same material. The flash fractionator is lined with 11-13 per cent chromium sheet in the lower two-

TABLE 13—THERMAL CRACKING TO FUEL OIL*

Stock—	Feed	Producing 7.0° A.P.I. tar: Naphtha	Producing 7.0° A.P.I. tar: Tar	Producing 5.1° A.P.I. tar: Naphtha	Producing 5.1° A.P.I. tar: Tar
Gravity, °A.P.I.	16.8	64.9	7.0	63.5	5.1
Sulfur, lamp, per cent	....	.185	....	.18	....
Sulfur, bomb, per cent	3.09	....	4.17	....	4.21
R.v.p., lb.	....	8.9	....	6.1	....
B.s. and w., per cent	0.2	....	0.2	....	0.4
Viscosity:					
S.S.U. at 122° F.	832	....	2,291	....	3,607
S.S.F. at 122° F.	88.4	....	260	....	417
S.S.F. at 77° F.	680	....	2,822	....	....
Flash point, Cleveland, °F.:					
Open cup	290	....	220	....	225
Flash point, Pensky-Martens, °F.	....	....	275	....	290
Fire Point, °F.	440	....	365	....	385
Carbon residue, per cent	7.32	....	13.7	....	15.1
Sediment by extraction, per cent	.07	....	0.1	....	.085
Pour point, °F.	+65	....	+45	....	+45
Wax, per cent	9.39	....	3.94	....	3.13
A.S.T.M. distillation, °F.:					
I.b.p.	....	94	....	110	....
10 per cent	....	126	....	144	....
20 per cent	....	146	....	157	....
50 per cent	....	207	....	208	....
70 per cent	....	249	....	246	....
90 per cent	....	294	....	290	....
End point	....	332	....	332	....
Recovery, per cent	....	98.0	....	98.0	....
U.O.P. characterization	11.4	....	....	....	....

*The combined gas yield for the two operations are: (weight per cent of feed): C_3 and lighter, 3.4; propylene, 1.7; propane, 2.6; butylenes, 2.1; isobutane, 0.4; normal butane, 1.7; total, 11.9.

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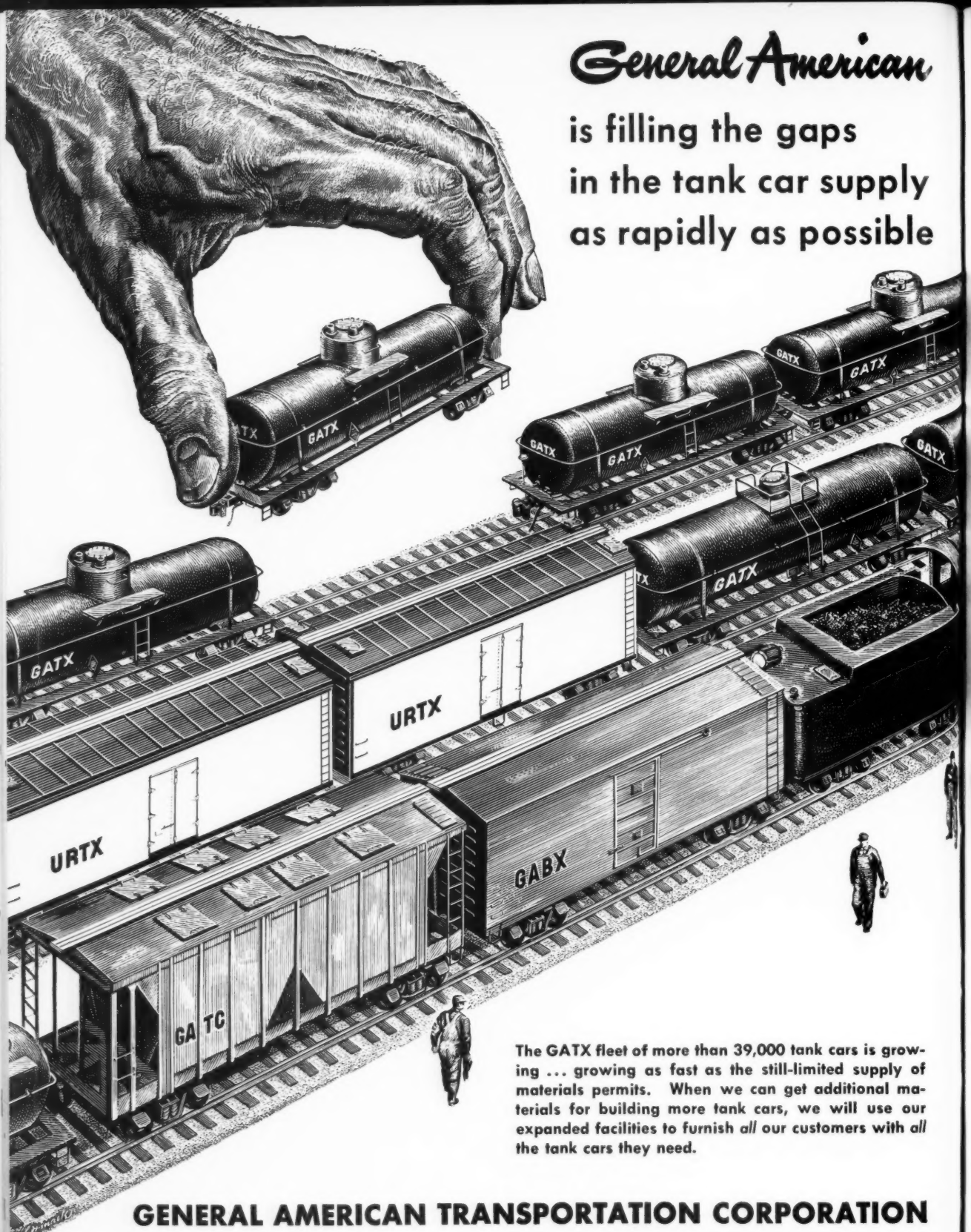

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thirds of the tower. The two trays below the trap pan are 11-13 per cent chromium sheet, the remainder are cast-iron bubble caps on steel decks. A carbon-steel wear plate has been installed in the flash section of the tower to counteract erosion by the feed. The remainder of the towers and vessels throughout the unit are carbon steel. The quench and polymer tower bottom pumps are provided with 11-13 per cent chromium steel cases and 18-8 chromium-nickel impellers. All other pumps are provided with cast-iron alloy impellers. Clay towers are incorporated in the unit to improve stability and lower the gum content of the final product. The screens in these towers are made of 18-8 per cent chromium-nickel alloy steel.

The Ras Tanura refinery treats reformed and straightrun naphthas. Gasoline produced by blending light straightrun and reformed gasolines is low in sulfur, which varies between 0.04 and 0.06 per cent. Simple, one-stage caustic washing is employed with light straightrun and reformed clay treater stocks respond readily to lead sulfide sweetening, producing a doctor sweet product of good stability. It is reasonable to expect the straightrun naphthas would respond normally to solvent treating or catalytic desulfurization.

Diesel Fuel

The diesel-oil fraction can be varied widely, depending on the kerosine and residual cuts. A yield of 15 to 35 per cent of high-speed diesel fuel is possible. While the sulfur in these diesel cuts ranges from 0.5 to 1.2 per cent, experience has shown it to be noncorrosive, and no excessive engine maintenance occurs. The cetane number is high, varying from 56 to 61. Viscosity ranges from 34 to 38 Universal Saybolt seconds at 100° F., and pour point varies from —10° to +20° F. Higher yields of diesel fuel are possible if a portion is made as industrial grade. Should severe crude topping conditions be employed, it may be necessary to caustic wash the diesel fuel in order to pass the copper-strip corrosion test. This could be accomplished by injection of caustic into the rundown line to the diesel-fuel rundown tank and recirculation of caustic from the bottom of the tank.

Lubricating Oils

Commercial-plant data on the manufacture of lubricating oils from Arabian crudes are not available. How-

TABLE 14—THERMAL CRACKING TO COKE

Properties of feed:	Topped crude	Reduced crude
Operations charging:		
Gravity, °A.P.I.	28.1	17.0
S.S.F. at 122° F.		97
S.S.U. at 100° F.	71	
Sulfur, per cent	1.82	3.04
Pour point, °F.	30	55
Flash, Pensky-Martens, °F.	180	410
U.O.P. characterization	11.76	11.52
Distillation (vacuum (corrected):		
I.b.p., °F.	372	630
10 per cent	435	756
20 per cent	481	796
50 per cent	671	904
70 per cent	817	...
90 per cent	...	...
End point	950	975
Per cent over	89.0	71.0
Bottoms, per cent by wt.	11.6	30.0
Operation:		
Pressures, psig.:		
Heavy-oil coil	250	250
Light-oil coil	350	350
Flash chamber	50	40
Temperatures, °F.:		
Heavy-oil transfer	915	910
Light-oil transfer	960	960
Reaction chamber	879	875
Fractionator bottoms	694	702
Rates, gal. per hour:		
Raw oil	1.16	1.71
Heavy combined feed	4.0	4.0
Light combined feed	3.0	3.0
Combined feed ratio	6.0	4.1
Yields, vol. per cent of charge:		
Gasoline, 400 e.p., 9.5 R.v.p.	69.7	60.7
Liquid recovery	69.7	60.7
Liquid volume loss	30.3	39.3
Coke drum gas, cu. ft. per bbl. charge	252	492
Stabilizer gas, cu. ft. per bbl. charge	580	483
Total gas, cu. ft. per bbl. charge	832	975
Yields, wt. per cent of charge:		
Gasoline, 400° e.p., 9.5 R.v.p.	58.1	46.7
Coke	19.9	31.0
Coke drum gas	4.9	9.0
Stabilizer gas	16.5	12.3
Recovery	99.4	99.0

15—PROPERTIES OF CRACKED PRODUCTS

Composition gas streams (producing stabilized gasoline):	Topped crude — Coke chamber	Topped crude — Stabilizer	Reduced crude — Coke chamber	Reduced crude — Stabilizer
Specific gravity	0.80	1.16	0.89	1.12
Composition (H_2S free, volume per cent):				
H_2	10.5	4.2	8.6	3.8
N_2	4.8	1.6	3.5	2.2
CO	0.4	0.1	0.1	0.0
Methane	52.9	14.9	55.7	20.4
Ethylene	1.0	4.7	0.4	4.3
Ethane	17.0	25.4	16.9	22.9
Propylene	1.9	14.6	1.2	6.6
Propane	6.4	22.1	7.2	31.0
Isobutylene	...	2.2	...	0.9
n-Butylenes	1.2	4.1	1.1	2.2
Butanes	2.4	4.7	3.5	3.8
Pentanes	1.5	1.4	1.8	1.9
Total	100.0	100.0	100.0	100.0
H_2S	0.3	0.7	4.3	2.6
Sulfur, weight per cent	4.3	1.0	6.0	2.6
Stabilized gasoline:				
Gravity, °A.P.I.		60.1		61.3
Total sulfur, per cent		0.12		0.15
R.S.H., per cent		0.04		0.05
R.v.p., lb.		9.5		9.6
Octane, A.S.T.M. motor method, clear		67		67.5
Peroxide No.		1.94		2.08
Distillation:				
I.b.p., °F.		97		100
10 per cent		128		137
50 per cent		256		248
90 per cent		360		357
End point		396		395
Per cent over		96.5		96.5
Per cent bottoms		1.0		1.0
Per cent loss		2.5		3.5
Composition, volume (%):				
C_3				0.20
Isobutylene		0.78		0.98
1-Butylene		1.16		1.62
2-Butylene		1.26		1.78
Isobutane		0.45		1.01
n-Butane		3.12		4.58
Pentanes		93.23		90.01
Total		100.00		100.00
Debutanized gasoline:				
Gravity, °A.P.I.		57.3		58.6
Total sulfur, per cent		0.12		0.16
R.S.H., per cent		0.04		0.04
R.v.p., psig.		5.6		4.2
Octane, A.S.T.M. motor method, clear		65		64
Distillation:				
I.b.p., °F.		126		135
5 per cent		154		157
10 per cent		165		170
30 per cent		210		207
50 per cent		261		254
70 per cent		309		296
90 per cent		354		348
End point		401		399

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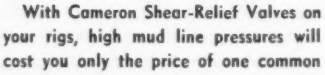

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ever, laboratory data indicate that high-quality lubricating oils may be produced by conventional solvent refining methods. Typical data are presented in Tables 9, 10, and 11, based on laboratory work done by The Texas Co., using furfural solvent refining, propane deasphalting, and methyl ethyl ketone-benzol dewaxing. Approximately 35 per cent of crude residuum will yield 16 to 18 per cent of crude as finished high-viscosity-index lubricating oils.

Table 9 gives a laboratory breakup of an Arabian crude-oil residuum with A.P.I. gravity, flash, viscosity, and color of approximately 3 per cent fractions on a basis of the crude oils.

Table 10 summarizes data obtained in producing S.A.E.-10 oil from wax stock, and bright stock from reduced crude using solvent extraction with furfural, M.E.K. benzol dewaxing and filtering, with an additional preliminary deasphalting step in the bright-stock manufacture. The waxy neutral stock gave a 63 per cent yield of S.A.E.-10 oil and the residuum gave a yield of 33.3 per cent bright stock. The viscosity indices of the S.A.E.-10 oil and the bright stock were 95.6 and 98.8 per cent respectively.

Table 11 summarizes data on the manufacture of 70-viscosity neutral oil, S.A.E.-20 oil, and cylinder stock. The same process steps were used as in Table 10. The light wax distillate gave an 82.7 per cent yield of neutral oil, the heavy waxy neutral stock gave a yield of 41.6 per cent of S.A.E.-20 and the heavy residuum furnished 49.6 per cent of finished cylinder stock.

Results of the laboratory investigations made by The Texas Co. indicate that satisfactory motor, diesel, aircraft, and gear oils could be manufactured from Arabian crude. It was concluded from engine tests that the relatively high sulfur content of the products may be beneficial in regard to bearing corrosion and oil oxidation. The base oils were less corrosive than corresponding oils from sweet crudes. The response of refined base oils to additives was normal in every respect.

In all the data presented herein, lube oil manufacture is shown by the use of the refining steps outlined in the accompany tabulations; however, it is possible that similar results in refining Arabian residuum may be obtained by use of other solvent methods.

A complete evaluation of the qualities of wax made from Arabian crude has not been made. Processing of the slack wax obtained in solvent dewaxing a wide cut wax distillate representing 20 per cent of crude should result in the production of approximately 1.4 per cent (based on crude) of fully refined, white crystalline paraffin waxes ranging in melting points from 122° to 135° F.

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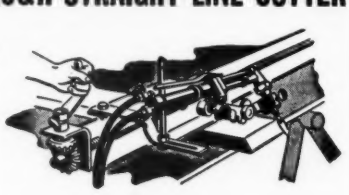

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and below 0.5 per cent oil and moisture (A.S.T.M. method), plus 25 Saybolt color and normal crystalline structure. The wax obtained from dewaxing operations on residual stocks should process for a yield of approximately 0.8 per cent based on crude of microcrystalline waxes ranging in melting point from 145° to 155° F.

There is no question of the refiner being able to manufacture industrial lubes such as spindle, cylinder, penetrating, cutting, turbine and hydraulic oils. Excellent heavy duty diesel lubes and a complete line of greases can be manufactured. It is anticipated that a gear oil meeting U. S. Government Specifications 2-105B can be made using Arabian base oils; also a full line of gear oils could be compounded.

Fuel Oil and Asphalt

Fuel oil produced from straightrun Arabian residuum possesses excellent stability, forming no sediment as indicated by the Naval Boiler and Turbine Laboratory heater test given in Navy Specifications 7-0-1f, dated October 2, 1944. Compatibility with cracked fuels, however, is limited.

Crude currently produced will yield from 7 to 8 per cent of good quality asphalt by vacuum reduction to 7°-8° A.P.I. residuum, and subsequent airblowing. Satisfactory asphalts have been made in the laboratory by vacuum reduction of Arabian crude and limited plant data of Bahrein Petroleum Co. confirm that good quality asphalt may be made by the vacuum reduction mentioned above.

Residuum Cracking

The Bahrein Petroleum Co. operates U.O.P. two-coil selective cracking units. The data in Table 12 summarizes the properties of a residuum and the products which can be made from it by varying the conditions of cracking. The yields are average for two units. Table 13 gives more details on the feed stock, gasoline and residuum produced in these units. The sulfur is over 4 per cent in both residua but below 0.2 per cent in both cracked gasolines.

U.O.P. selective cracking units at Bahrein refinery are protected against corrosion by the installation of 18 per cent chromium-8 per cent nickel tubes in the heaters and 4-6 per cent chromium-0.5 per cent molybdenum transfer lines. The reaction and flash chambers are lined with 11-13 per cent chromium steel sheet. The fractionation tower is lined with 11-13 per cent chromium steel sheet almost to the top; the bottom three-fourths of the trays are also of 11-13 per cent chromium steel. The remaining trays are cast iron. The stabilizer and absorption columns are carbon steel. The heavy oil and residuum pumps are lined with 11-13 per cent chromium alloy; cold oil pumps are steel and

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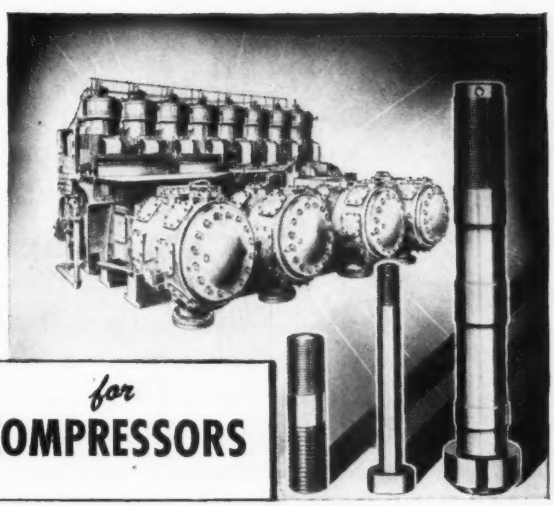

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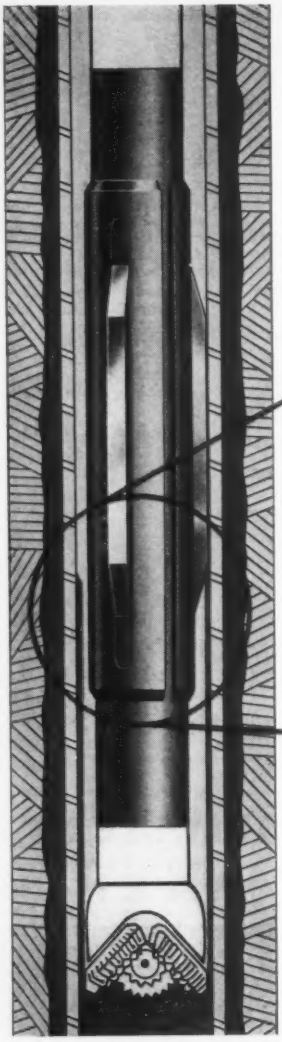
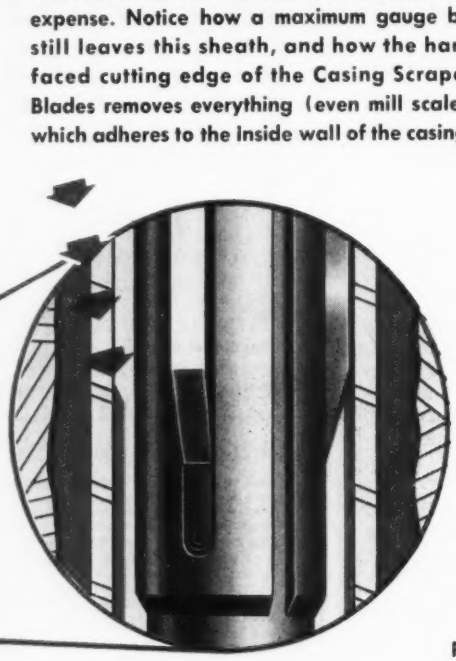


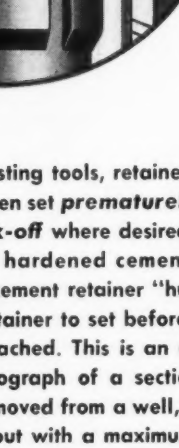
Here's that thin sheath (or skin) of cement or hardened mud that causes all the trouble and expense. Notice how a maximum gauge bit still leaves this sheath, and how the hard faced cutting edge of the Casing Scraper Blades removes everything (even mill scale) which adheres to the inside wall of the casing.



Baker Rotary Casing Scraper Product No. 620-B

Here's why testing tools, retainers, and similar devices often set ***prematurely;*** or ***fail to set and pack-off*** where desired. Notice the marks in the hardened cement where the wickers of a cement retainer "hung up" and caused the retainer to set before the desired depth was reached. This is an actual, unretouched photograph of a section of casing which was removed from a well, after having been drilled out with a maximum gauge bit.

BEFORE



AFTER

Here's how burrs left around gun-shot holes are scraped away and are no longer a menace or a nuisance. The inside of the casing is left "clean as a hound's tooth" ready for ***immediate*** completion work; and in proper condition for remedial or work-over operations a ***year or ten years in the future.***

LEAVE YOUR CASING CLEAN AND SMO

THE BAKER ROTARY CASING SCRAPER (Product No. 620-B) removes cement, paraffin, hardened rotary mud, burrs from gun-shot holes, and all other obstructions adhering to or protruding from the inside walls of casing. It eliminates the sharp, rough obstructions which cut, tear and mutilate the rubber packing units on swabs, packers and testing tools. It removes the mud and cement which often cause the premature setting of devices having wickers or slips before the desired depth has been reached. It leaves the inside walls of your casing clean and smooth, so that tools having a packing member can seal off properly; and the wickers or slips on other devices having metal-to-metal contact with the casing can grip securely.

MANY ADVANTAGES

THE BAKER ROTARY CASING SCRAPER can be run on drill pipe while the rig is up and the rotary crew is still on hand, and usually is installed just above the bit when drilling out the cement shoe, — see illustration opposite. In event the casing was not scraped at the time the well was completed, and obstructions are found that interfere with work-over or remedial operations, The Baker Rotary Casing Scraper can be run on tubing and either rotated manually with tongs over limited areas, or an endless spinning rope can be used when several hundred feet of casing are to be scraped. The strong construction, the self-equalizing blades with long, hard-faced scraping edges, all combine to insure fast, safe, low-cost operation.

REMEMBER THIS

Only the BAKER ROTARY CASING SCRAPER (Product No. 620-B) is equipped with springs behind the blades to provide constant, uniform contact with the side walls of the casing. For removing gun-shot burrs, all springs are used; for removing paraffin and similar softer substances some of the springs are removed, as maximum pressure against the casing is not required. You do not depend upon hydraulic pump pressure to maintain scraping contact against the casing, and yet, the BAKER ROTARY CASING SCRAPER is easy to run in or out of the well, and always scrapes maximum footage before the blades are dulled.

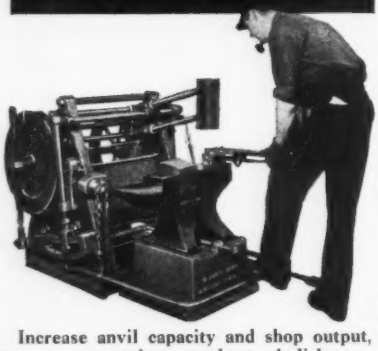
Remember also that **your** crews can run the BAKER ROTARY CASING SCRAPER successfully. The low-cost rental charge for domestic service, or the reasonable cost when purchased for over-seas use, is extremely cheap insurance for positive knowledge that the "working surface" of your casing is left clean and smooth, free from dangerous obstructions which interfere with future operations.

HOW TO ORDER

FOR DOMESTIC RENTAL USE: Get in touch with the nearest Baker representative. Furnish him with the size, type and weight of casing which is to be scraped; also the size and type of drill pipe or tubing thread connections desired on the BAKER ROTARY CASING SCRAPER. Give him an idea about what kind of material is to be scraped off the inside of your casing, and about how many feet are to be scraped. Then leave the rest up to the Baker man — he will take good care of you.

FOR OVER-SEAS USE: Address inquiries to Baker Oil Tools, Inc., 11 West 42nd St., New York 18, N.Y. or Box 2274 Terminal Annex, Los Angeles 54, California or refer to Page 488 of the 1948 Baker (or Composite) Catalog for specifications and recommendations to select one or more BAKER ROTARY CASING SCRAPERS. Be prepared to leave the "working surface" of your casing in **every** well clean and smooth and ready for all future operations.

Make Every Blow Count
WITH A
McKiernan-Terry
BLACKER HAMMER



Increase anvil capacity and shop output, get more operations per heat, abolish confusion around the anvil—by giving your smith a McKiernan-Terry Blacker Hammer. This direct-geared, electric-driven hammer does the work of several human helpers around the anvil. Delivers sledge-hammer blows exactly *where* and *when* the smith needs them. Send for free Bulletin No. 56, giving full information.
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cast iron. Centrifugal pumps are employed throughout.

Pilot-plant data are presented which show the yields to be expected when cracking topped and reduced Arabian crudes in a coking operation. Table 14 gives the properties of the topped and reduced crudes, the temperatures, pressures, and feed rates of cracking, and the yields of products from the cracking runs. Table 15 gives the principal properties of the cracked products. Cracking of topped crude yielded 69.7 volume per cent of 400° F. end point, 10 lb. R.v.p. gasoline with a motor-method octane number of 67, while the reduced crude yielded 60.7 per cent of 67.5 motor-method octane product with the same distillation and vapor-pressure characteristics as that from topped crude. The sulfur content of the debutanized gasolines was 0.12 and 0.16 per cent with the same mercaptan sulfur of 0.04 per cent.

TABLE 16—FLUID FLOW CATALYTIC CRACKING OF ARABIAN GAS OIL*

Feed stock—naphtha free wide-cut oil—	Volume % on crude	Position in crude
Naphtha-free diesel oil	21.8	34.6-56.4
Heavy gas oil	17.9	56.4-74.3
Vacuum gas oil	17.3	74.3-91.6
	57.0	34.6 to 91.6
Gravity, °A.P.I.	30.1	
Distillation, A.S.T.M.:		
I.b.p., °F.	466	
5 per cent	503	
10 per cent	516	
20 per cent	546	
30 per cent	580	
40 per cent	621	
50 per cent	661	
60 per cent	701	
70 per cent	725	
Recovery, per cent	81.5	
Residue, per cent	18.4	
Loss, per sent	0.1	
Aniline point, °F.	175	
Bromine No. G./100 g.	3.8	
Viscosity:		
S.S.U. at 100° F.	70.7	
S.S.U. at 122° F.	53.1	
Carbon residue, wt. per cent	0.42	
Sulfur, wt. per cent	1.50	
Operating conditions—		
Catalyst	Synthetic	
Temperature, °F.	900	
Conversion, 400° F. e.p. (volume per cent)	50	
Type of operation	Recycle	
Throughput ratio	1.4/1.0	
Product yields—		
Coke, 90 per cent carbon, wt. per cent	3.8	
Dry gas, wt. per cent	5.7	
Propylene, vol. per cent	5.0	
Propane, vol. per cent	1.7	
Butane-butylenes, vol. per cent	8.7	
Butylenes, vol. per cent	5.8	
Debut. motor gaso., 400° F. e.p., vol. per cent	40.3	
10-lb. R.v.p. motor gaso., 400° F. e.p., vol. per cent	43.0	
Excess C_4's, vol. per cent	6.0	
Furnace oil (90 per cent at 600° F., vol. per cent	45.0	
Residual cycle oil, vol. per cent	5.0	
Total cycle oil above 400° F., vol. per cent	50.0	
Product properties—		
Debut. motor gasoline:		
Gravity, °A.P.I.	56.5	
A.S.T.M. motor method octane, clear	81.2	
+1.5 cc. TEL	84.6	
+3.0 cc. TEL	86.0	
A.S.T.M. research method octane, clear	93.7	
+1.5 cc. TEL	97.1	
+3.0 cc. TEL	98.0	
10-lb. R.v.p. motor gaso.:		
Gravity, °A.P.I.	58.8	
A.S.T.M. motor method octane, clear	82.1	
+1.5 cc. TEL	85.9	
+3.0 cc. TEL	87.4	
A.S.T.M. research method octane, clear	93.8	
+1.5 cc. TEL	97.6	
+3.0 cc. TEL	98.6	
Furnace oil (90 per cent at 600° F.):		
Gravity, °A.P.I.	32.0	
Residual cycle oil:		
Gravity, °A.P.I.	15.0	

*Texas Co. data; work done by M. W. Kellogg Co.

Catalytic Cracking

Table 16 contains fluid flow catalytic cracking data based on pilot-plant investigation using a wide cut gas oil as charging stock.* The data are typical for a recycle type of operation at 900° F. reactor temperature and 50 per cent conversion. The charging stock was composed of a diesel oil, a heavy gas oil produced by atmospheric topping and an oil produced by vacuum flashing. This charge totaled 57 per cent of the crude oil. The yield of 10 lb. R.v.p., 400° F. end point gasoline was 43.0 per cent, furnace oil 45 per cent, and residual cycle oil 5 per cent. The clear octane rating of 10-lb. gasoline was 82.1 by the A.S.T.M. motor method and 93.8 by the research method, which shows the adaptability of the fluid catalytic cracking process in producing high-octane gasoline from the intermediate distillates from Arabian crude.

*Texas Co. data; work done by M. W. Kellogg Co.

September Oil Production For Canada Shows Increase

OTTAWA, Canada.—The output of crude petroleum and natural gasoline from Canadian fields in September is officially reported at 1,100,714 bbl. compared with 652,989 bbl. in the same month of 1947. Alberta contributed 978,018 bbl. of which 379,071 bbl., including natural gasoline, came from Turner Valley, and 461,576,661 bbl. from Leduc. Production in barrels from other provinces was: New Brunswick, 1,792; Ontario, 14,859; Saskatchewan, 80,757; and Northwest Territories, 25,288.

For the 9 months' period ending September 30, 1948, production from all Canadian fields totaled 8,649,474 bbl. compared with 5,516,421 bbl. for the same period last year. All the provinces except New Brunswick showed increases.

Export Controls Chief Factor

(Continued from page 172

and from which it may be necessary to withhold some goods in order to satisfy Europe's requirements must be kept satisfied.

Most seriously affected by this policy might be Latin America, in itself a very substantial market for American petroleum equipment exporters and at the same time the area to which we would have to look for oil to supplement our own supplies in the event of war.

So far, apparently, the Latin-American countries have found no basis for formal complaint, although United States companies operating in Venezuela have charged they are being deprived of supplies essential for the large-scale expansion of production which they are attempting to develop. These charges, however, are directed against the export controls, which are the visible manifestation of policy as reached by consultation between the Department of Commerce and the State, Defense, and Interior departments and other agencies.

The influence of international policy also is disclosed by the sharp reduction of shipments to Russia and the countries behind the iron curtain. Russia, which secured approximately $5,000,000 worth of material during the first half of 1947, the bulk of it refining and other equipment, received less than $3,000,000 worth in the same period this year, all exported in the early months of the year, and shipments have been practically cut off from Czechoslovakia, Poland, Yugoslavia, and Romania. Romania received about $1,171,000 worth of drilling equipment early in the year, but later was refused additional equipment amounting to some $9,500,000.

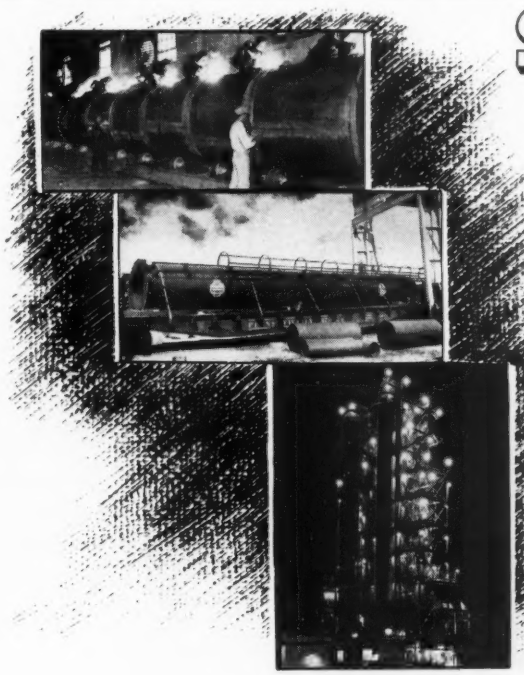
That exports during the first half of 1948 represented only a part of what the world needs is indicated by the fact that they do not reflect any important part of the nearly $2,000,000,000 worth of oil equipment which the Marshall plan countries estimated a year ago they would require during the life of the European recovery program for themselves and their overseas dependencies.

The original estimates, of course, were cut sharply when they reached this country, the proposal for $499,000,000 for the first fiscal year being reduced to $226,700,000. But it has been only within the past few months that any of the western European countries have submitted their equipment programs to the Economic Cooperation Administration in Washington, and the first long-range program only recently has gone through the mill, most of the procurement authorizations sought by the Marshall plan nations up to as late as October being primarily for commodities for sustenance and relief, rather than capital goods for industrial rehabilitation and expansion.

The Marshall plan, as developed and administered, is aimed, first, at meeting the immediate needs of the participating countries for relief of their people and rehabilitation of their industries; second, at the expansion of industry so as to relieve the drain on our resources, and third, at a great development of public works and internal improvements.

The first objective has about been attained, and the second phase of the program will shortly get under way; this includes a projected 250 per cent increase over 1938 in petroleum-refinery capacities in the participating countries and Bizone Germany by mid-1952, when the present plan will terminate. The third part of the plan, which will include railway, road and water transportation development, etc., also will come into operation shortly, as funds become available. These developments are being financed in part by loans from the United States and in part from the so-called counterpart funds the several countries are accumulating.

While the United States is making grants of the funds used for the procurement of petroleum equipment and some 70 other categories of ma-



STEP BY STEP REFINERIES ARE BUILT

McNamar is rounding out another year of record-building steel fabrication service to the oil industry. In the course of 20 years at McNamar, countless fabricating problems have been shaped into powerful, dependable vessels — vessels that faithfully serve the great OIL INDUSTRY — hour by hour.

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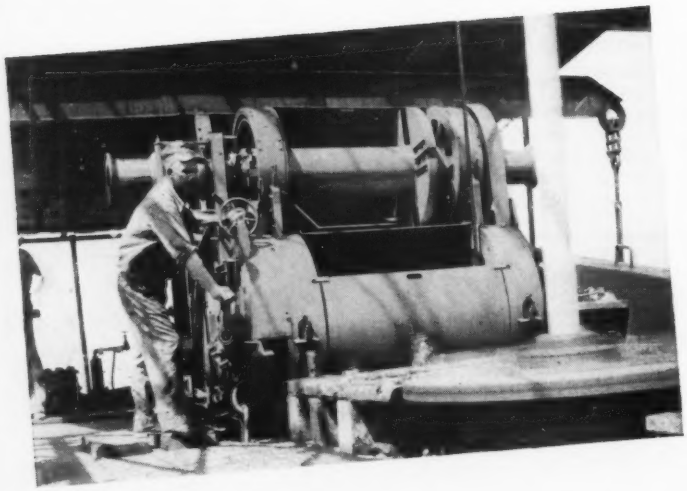
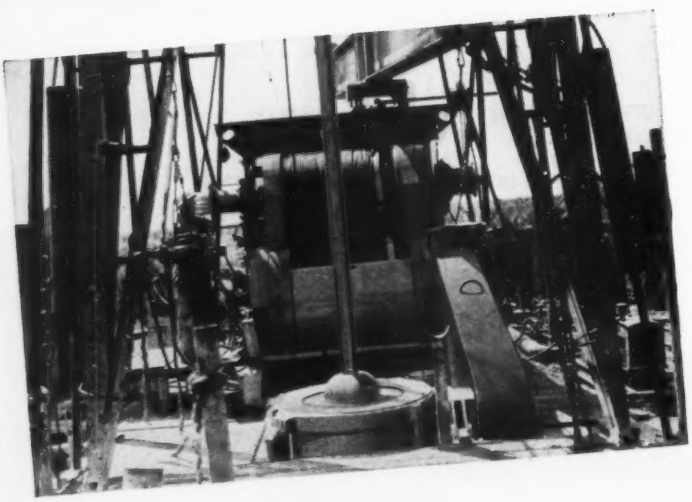


Model H, Model K and Model R are recommended for drilling to 2,500, 3,500 and 4,500 feet respectively with 4½" drill pipe, and workover jobs to 5,000, 7,000 and 10,000 feet. "Cardwell" friction clutches operate both drums and the rotary table drive.

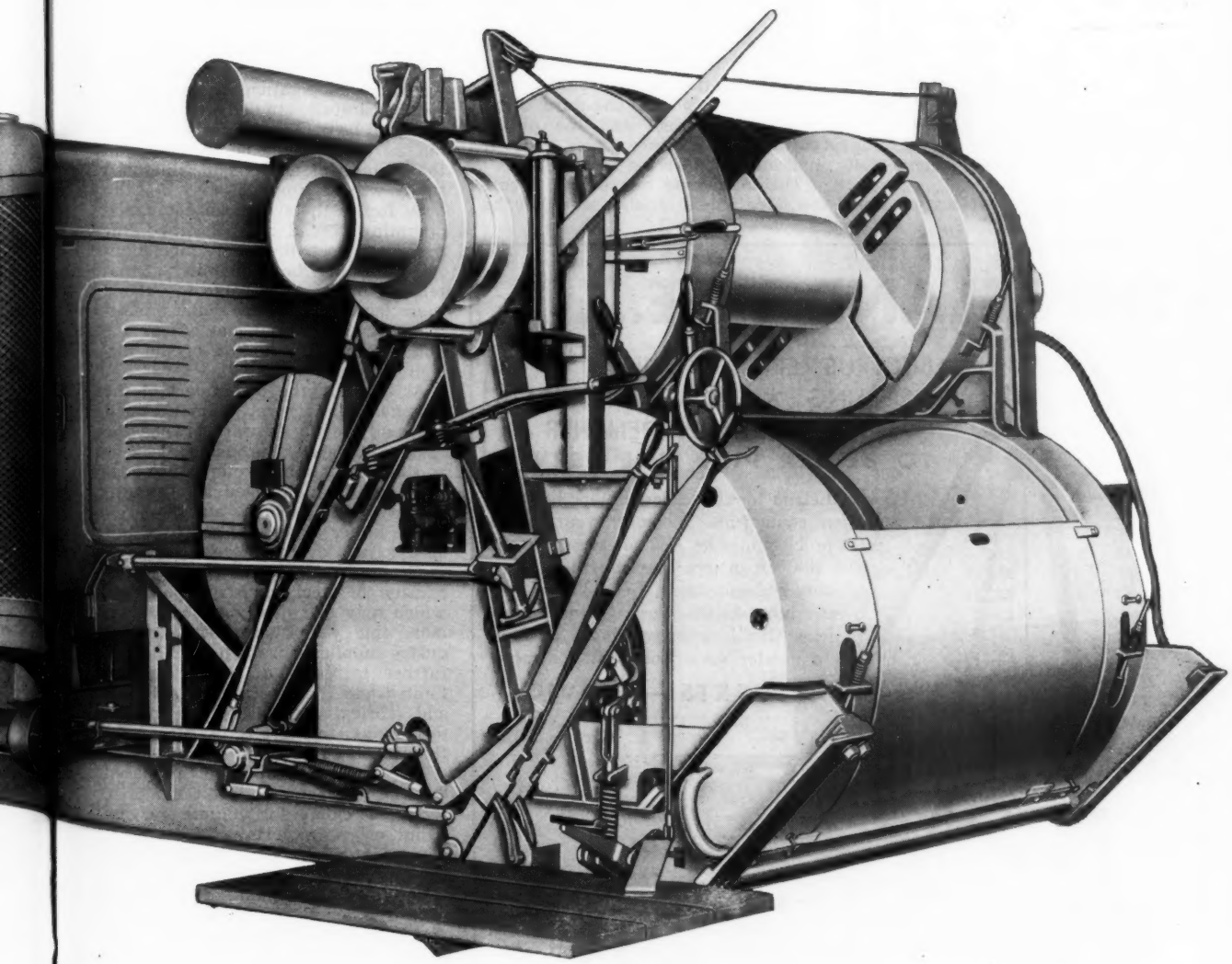
All three models can be converted to cable tool operations by changing from rotary to spudder. Model H is recommended for cable tool drilling to 3,600 feet, Model K to 5,000 feet, and Model R to 7,500 feet. 55- or 65-foot double leg mast is available.



Model R is available with beam assembly for cable tool drilling, well servicing, and pumping potentials. The rotary assembly and beam can be installed on the same rig, making it possible to do cable tool and rotary work with no changes in equipment. A special wide-spaced mast is available when the Model R with beam is used for cable tool work. Model R is recommended for rotary drilling to 4,500 feet with 4½" drill pipe, and cable tool drilling to 7,500 feet.

drilling and servicing rig

—MAKES MORE PROFITS



The profit advantage of this "Cardwell" rig is its versatility. This combination rig can be equipped to do every kind of rotary or cable tool drilling and servicing job, and its performance is always outstanding.

Hundreds of operators have proved the "Cardwell" rig is a money-maker because of its fast operating speed, minimum haulage costs and low maintenance expense. There are three sizes of "Cardwell" combination rigs to fit your requirements. *Write for complete information.*

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WHEN IT'S A "CARDWELL," THERE'S NO EQUAL IN QUALITY

terials and products, the European industries which actually acquire the goods do not get them as a gift. For every dollar of ERP money spent for oil equipment, for instance, the foreign oil company which gets it must deposit an equivalent sum in local currency with its government. This money goes into a special fund, 5 per cent of which is reserved to pay the expenses of the Economic Cooperation Administration mission in the country and to finance the procurement by the United States of strategic materials and the remainder is used by the participating government to finance programs for national development.

There has been a great deal of confusion regarding the petroleum-equipment needs of the Marshall plan countries. The original estimate of $1,815,000,000 for the home countries and $33,000,000 for their overseas dependencies did not make any provision for the needs of United States companies operating in the participating countries, and gave no details regarding the plans of individual countries for expansion of their oil industry. At the same time, it was contemplated that the United States would provide something less than one-third of the needed equipment and the participating countries themselves would finance or produce the remainder.

The immediate reaction of American government officials was that the program thus only generally outlined was far beyond what actually could be produced, particularly if European equipment manufacturers were to draw upon steel supplies in this country for their raw materials, and there was more than a mere suspicion that some of the countries planned to convert pretty generally from a coal to an oil economy.

The detailed programs which the several countries will submit to the Economic Cooperation Administration will be carefully studied and undoubtedly will be pared down substantially, but as yet there is no indication of the volume of equipment which actually will be supplied.

So far as the American companies operating abroad are concerned, the program affects them only incidentally by limiting the availability of material, since they are able to expand their facilities by new dollar investments which would not affect the dollar-exchange situation of the foreign countries.

As a result, the big impact of the Marshall plan is yet to make itself felt, and the tug of war between the requirements of European recovery and the limitations of our export controls will be manifested in a significant way in the months ahead.

The larger exports of the first half of this year over the same period in 1947 were made possible by the expansion of steel industry operations which may add nearly 1,000,000 tons more this year than last to oil-industry supplies, but the possibilities of further increases in production are limited and the shortage of materials and fabricating facilities is expected to continue to exert a restraining influence on exports for several years.

The accompanying table, prepared by the Department of Commerce, shows the changes in volume and distribution of exports of petroleum equipment which have resulted from the play of all these factors.

Because of the enhanced importance of this business the Census Bureau, which gathers import and export statistics, plans next year to refine its classification of tubular goods and equipment so as to provide more complete information as to just what is being shipped abroad.

Instead of having merely two classifications for casing and line pipe, it will report under the headings, respectively, of seamless and welded, line pipe, drill pipe, drive pipe, gas pipe, oil-well pipe, rotary, upset, and well casing. What is now listed as refining machinery and parts will show separately prospecting equipment, probably including a subdivision for geophysical equipment, etc.; drilling equipment, production equipment and refining equipment. Under the new classification, a complete refinery would be reported under refining equipment, including the pipe therein, but pipe shipped separately would be shown as such.

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Summary of International Production

Compiled From Data Presented in the Following 11-Page Annual Survey

Country (by areas)—	No. of producing wells: Flowing	No. of producing wells: Pumping	Producing depths: Shallowest (ft.)	Producing depths: Deepest (ft.)	Daily avg. prod. (bbl.)	Accumulated prod. 7-1-48 (1,000 bbl.)	Wells drilling	Gravity, A.P.I.°
Argentina	*496	2,534	500	8,200	60,300	372,909	....	19-53
Bolivia	*49	19	3,200	4,300	1,420	4,065	9	26-53
Brazil	20	48	1,000	4,000	(Potn) 9,370	421	3	26-42
Canada	2,238	162	350	10,000	35,220	134,473	53	10-47
Chile	15	....	7,000	7,500	Shut in	....	....	42
Colombia	*202	823	100	8,500	75,000	426,646	14	20-42
Cuba	....	225	600	1,800	800	....	....	20-45
Ecuador	119	626	800	5,000	6,660	4,154	....	36-41
Mexico	†911	163	429	7,250	164,310	2,352,142	17	12-36
Peru	*341	2,799	500	7,000	40,300	294,591	14	34-43
Trinidad	*808	1,199	300	8,500	59,710	373,348	13	18-31
Venezuela	2,895	3,073	100	11,150	1,290,168	3,680,711	90	12-58
Total W. Hemisphere (excl. U. S.)	8,094	11,671	100	11,150	1,743,258	7,643,460	213	12-58
Albania	....	....	....	....	1,000	....	....	....
Algeria	....	12	400	2,000	3	230	....	....
Austria (no data on flowing vs. pumping)	....	618	400	8,500	14,672	50,707	....	13-48
Czechoslovakia	....	....	500	800	650	4,250	....	....
Egypt	*45	100	700	3,800	35,800	115,320	3	22-39
England	....	§242	100	2,500	819	3,964	....	28-40
France	†10	656	100	6,000	1,423	14,850	23	30-35
French Morocco	3	56	300	5,500	345	385	3	34-45
Germany	*141	1,431	....	....	11,873	74,789	40	16-40
Hungary	168	12	250	4,900	10,340	41,088	4	38-43
Italy	....	223	500	2,400	100	1,442	....	31-50
Netherlands	1	46	2,500	2,700	9,450	3,360	1	25
Poland	....	2,350	....	....	2,300	....	....	....
Romania	....	....	600	9,800	70,440	1,185,000	....	25-52
Yugoslavia	....	....	4,000	4,200	1,000	2,700	....	....
Total Europe and North Africa	368	5,746	100	9,800	160,215	1,498,085	74	13-52
Bahrein Island	*†70	....	1,900	2,300	30,000	93,391	1	33
Iran	§144	....	2,000	9,000	523,000	1,830,400	6	33-66
Iraq	‡§33	....	2,750	3,000	97,000	401,700	2	36-43
Kuwait	22	....	....	4,700	135,000	33,000	6	32
Qatar	2	....	5,000	6,000	Shut in	....	1	36
Saudi Arabia	*66	‡18	2,000	10,000	382,000	265,210	8	30-37
Turkey	....	....	....	4,400	150	....	....	....
Subtotal Middle East	337	18	1,900	10,000	1,167,150	2,623,701	24	30-66
Burma (rehabilitating)	....	....	100	5,000	1,000	300,000	....	36
China	26	....	....	....	1,000	1,000	2	32
India	365	260	500	5,000	5,100	42,200	....	36
Japan	28	3,911	300	5,000	3,400	80,281	....	17-40
Pakistan	5	....	5,200	8,200	1,260	Over 9,000	1	22-37
East Indies:			160	6,400	68,555	553,086	8	14-43
Borneo	‡164	528						
Ceram (no rehabilitation)	....	....	240	920	....	8,203	....	23
Java (incomplete)	4	42	320	6,000	1,270	109,769	....	24-43
Sumatra (incomplete)	418	1	100	8,000	71,120	572,325	13	22-64
New Guinea	11	....	300	3,225	Shut in	13	....	19-48
Subtotal Far East	1,021	4,742	100	8,200	152,705	1,675,877	24	17-64
Total Eastern Hemisphere (excl. Russia and Baltic countries)	1,726	10,506	100	10,000	1,480,070	5,797,663	122	13-66
Grand total	9,820	22,177	100	11,150	3,222,328	13,441,123	335	12-66

*Service wells included: Argentina 329; Bolivia 34; Colombia 35; Peru 53; Trinidad 4; Egypt 2; Germany 10; Bahrein Island 4; Saudi Arabia 1. †Includes gas and condensate wells: Mexico 6; France 8; Bahrein Island 2. ‡Includes wells shut in: Iraq 8; Saudi Arabia 18; Borneo 11. §Includes observation and recycle wells: England 8; Iran 69; Iraq 11.

International

SURVEY of OIL FIELDS

THIS survey, compiled by the Journal's statistical department, is based on information obtained through the cooperation of the operating companies, and the governments of the countries in which the fields are located. Inasmuch as properties in some less-important oil countries are still under military control, information is not in all cases complete. Official data are not available on operations in Russia or Russian-controlled countries.

ARGENTINA

Name of field—	Year of discovery	No. of prod. wells Flowing	No. of prod. wells Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Coleta Olivia	1945	....	....	.....	41,700	284,777,000	..	Cretaceous sands	35°
Comodoro Rivadavia	1907	*308	2,253	2,300-5,300	Shut in awaiting p./l. outlet			Cretaceous sands	19°-26°
Mendoza	1925	30	33	500-8,200	8,600	27,151,000		Tertiary and Triassic sands	27°-30°
Plaza Huincul	1917	†56	152	2,000-4,000	7,100	24,246,000		Jurassic sands	22°-38°
Salta	1925	‡102	96	700-5,000	2,900	36,735,000		Perm.-Carb. and Devon. sands	23°-53°
Total		496	2,534		60,300	372,909,000			

*Includes 285 service wells. †Includes 35 service wells. ‡Includes 9 service wells.

AUSTRIA

St. Ulrich-Hauskirchen	1938	....	*343	2,700-3,800	6,500	18,750,000	..	Miocene sd.	31°
Maustrenk	1941	....	*44	2,700-3,300	400	1,130,000	..	Miocene sd.	26°
Muhlberg	1942	....	*18	1,500-5,300	4,000	3,500,000	..	Miocene sd.	30°
R. K. van Sickle	1939	....	*48	1,300-4,600	650	5,920,000	..	Miocene sd.	21°-27°
Gosting-Rag	1930	....	*86	2,100-7,700	2,500	10,800,000	..	Miocene-Flysch sd.	20°-27°
Gaiselberg	1938	....	*60	2,100-7,800	2,500	10,500,000	..	Miocene sd.	22°-27°
Hohenruppersdorf	1941	....	*5	3,300-5,400	100	80,000	..	Miocene-Flysch sd.	35°
Anderklaa	1942	....	*4	8,000-8,500	20	25,000	..	Miocene sd.	48°
Leoprechting	....	....	*10	400-500	2	2,000	..	Miocene sd.	13°
Total		....	*618		14,672	50,707,000			

*No data on flowing vs. pumping wells.

ALBANIA

Devoli area	....	....	....	.....	.....	.....	..	.....	...
Pahtoso area	....	....	....	.....	.....	.....	..	.....	...
Total		....	....		1,000				

ALGERIA

Tliouanet	1914	....	12	400-2,000	3	230,000	..	Miocene sds.	...

BAHREIN ISLAND

Bahrein	1932	*70	....	1,900-2,300	30,000	93,391,000	1	Cretaceous lime and siltstone	33°

*2 gas and 4 gas input.

BOLIVIA

Camiri	1927	*22	2	3,200	842	1,660,000	8	Devonian	53°
Sanandita	1926	†20	12	4,300	283	1,585,000	1	Permo-Triassic	42°
Bermejo	1925	‡7	5	3,400	295	820,000	..	Permo-Triassic	26°
Total		49	19		1,420	4,065,000	9		

*Includes 12 service wells. †Includes 16 service wells. ‡Includes 6 service wells.

BRAZIL

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Reconcaro area:									
Candeias	1941	11	30	4,030	*7,950	276,000	2	Cretaceous	26°
Don Joao	1947	1	6	1,000	*1,000	.....	1	.....	39°
Itaparica	1942	8	7	3,200	355	26,000	..	.....	30°
Lobato-Joanes	1939	..	3	2,000	50	65,000	..	.....	36°
Aratu	1942	..	2	2,000	15	54,000	..	.....	42°

*Potential production. Total Brazilian production about 1,500 bbl. daily.

BURMA

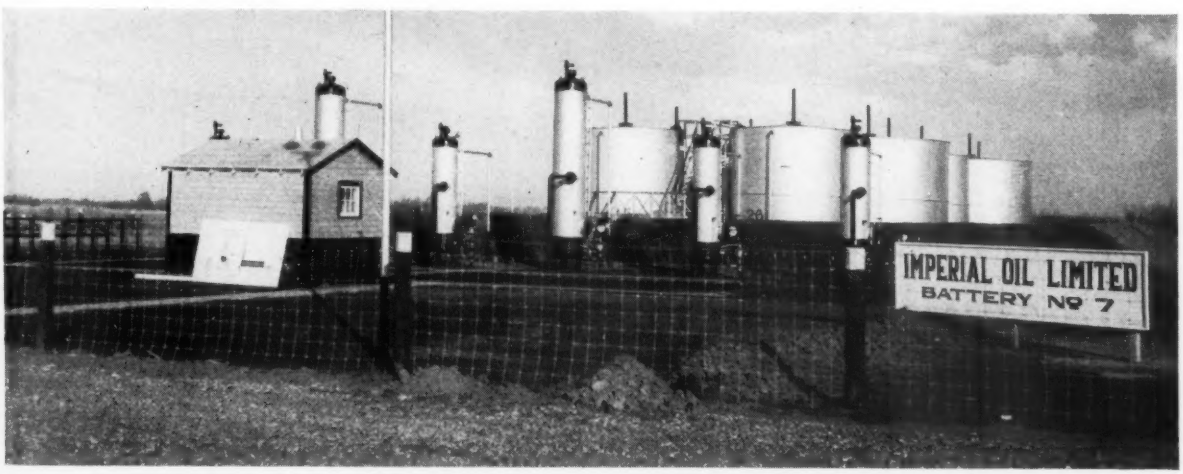
North Basin:									
Indaw	1918	(*)	..	1,100	(*)	.....	..	Miocene sd.	36°
Central Basin:									
Sabe	1908	(*)	..	100-1,800	(*)	..	..	Oligocene sd.	36°
Yenangyat	1893	(*)	..	400-4,200	(*)	..	..	Oligocene sd.	36°
Lanywa	1919	(*)	..	2,000-5,000	(*)	..	..	Oligocene sd.	36°
Singu (Chauk)	1902	(*)	..	2,000-5,000	(*)	..	..	Oligocene sd.	36°
Yenagyaung	1889	(*)	..	350-5,600	(*)	..	..	Miocene-Oligocene	36°
Minbu	....	(*)	..	450-700	(*)	.....	..	Miocene-Oligocene	36°
Palanyon	1910	(*)	..	2,300	(*)	..	..	Miocene-Oligocene	36°
Yethaya	....	(*)	..	.....	(*)	.....	..	Miocene-Oligocene	36°
South Basin:									
Yenamma	1922	(*)	..	600-1,700	(*)	..	..	Oligocene	36°
Padaukpin	1922	(*)	..	..	(*)	..	..	..	..
Pyaye	1928	(*)	..	..	(*)	.....	..	.....	..

*Rehabilitation work proceeding slowly. Current production 500-1,000 bbl. daily vs. prewar 22,000 bbl. daily.

CANADA

Conrad, Alta.	1943	..	17	3,100	482	676,882	..	Jurassic ss.	25°
Jumping Pound, Alta.	1945	2	..	10 000	Shut in	8,886	..	Madison limestone, Mississippian	47°
Leduc-Woodbend, Alta.	1947	126	..	5,000-5,400	14,859	1,655,894	34	Devonian limestone	40°
Lloydminster (Sask. and Alta.)	1939	*183	..	1,800-2,000	5,358	1,781,674	2	Lower Cretaceous ss.	10°-19°
Norman Wells, N. W. T.	1920	..	60	1,050-1,900	†815	2,654,109	..	Fort Creek limestone, Devonian	39°
Princess, Alta.	1939	12	4	2,500-3,990	573	368,496	2	Mississippian limestone, Devonian limestone and L. Cretaceous ss.	27°-34°
Taber, Alta.	1937	..	21	3,200	576	939,275	1	L. Cretaceous ss.	18°-24°
Turner Valley, Alta.	1914	*295	..	3,200-9,600	11,702	95,502,529	5	Madison limestone, Mississippian	39°-73°
Vermilion, Alta.	1938	..	52	1,800	297	1,036,653	1	L. Cretaceous ss.	14°
Wainwright, Alta.	1926	..	8	2,200	40	264,143	..	L. Cretaceous ss.	18°
Several small fields in southwestern Ontario	1860-1946	1,620	..	350-3,350	450	29,150,000 (approx.)	8	Devonian, Silurian, Ordovician ls.	34°-37°
Stoney Creek, N. B.	1910	..	..	1,000-3,200	68	434,700 (approx.)	..	Albert ss., Mississippian	37°
Total		2,238	162		35,220	134,473,241	53		

*No pumping—not known. †Partly shut in.



One of the newer consolidated tank-battery installations in Leduc field, 18 miles southwest of Edmonton, Canada. Production from the field's two producing zones is handled with separate high and low-pressure separators and tanks being provided for each zone. The extra separator at the right is for individual well testing

CHILE

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Manatiales (Spring Hill)	1945	*14	....	7,500	Shut in	None	2	Upper Cretaceous	42°
San Sebastian	1948	†1	....	7,000	Shut in	None	..	Upper Cretaceous	..

*7 oil wells; 6 gas wells; 1 testing. †Gas well being tested. Note: Production shut in until pipe-line outlet built. Projected completion date fall of 1949.

COLOMBIA

De Mares (Infantas, La Cira, Colorado and Galan	1915	*47	762	500-4,000	29,300	372,855,000	..	Olig.-Eocene ss.	25°
Barco-Tibu	1940	48	13	4,300-11,000	18,800	12,574,000	7	Barco; Catatumbo; Uribante	32°
Barco-La Petrolea	1933	42	2	100-2,000	6,500	27,979,000	..	La Luna; Cogollo; Uribante	20°
Barco-Carbonera	1939	0	2	3,300	100	150,000	..	Los Cuervos Barcos ss.	21°
Barco-Rio de Oro	1937	9	....	1,800-1,900	Shut in	67,000	..	Catatumbo, Rio de Oro ss.	39°
Cantagallo	1942	3	....	5,400-6,500	1,200	328,000	..	Olig.-Eocene sds.	21°
Casabe	1941	31	44	2,500-3,800	16,000	12,367,000	5	Oligocene sd.	21°
El Dificil	1943	18	....	5,500-5,800	3,000	278,000	2	Oligocene lime	42°
Velasquez	1946	2	....	6,700-8,500	100 (fuel)	48,000	1	Guaduas, Eocene sd.	27°
Total		202	823		75,000	426,646,000	14		

*Includes 35 service wells.

CHINA

Yumen	....	26	....	.....	1,000	1,000,000	2	.....	32°

CUBA

Jarahueca	1943	0	25	1,500	650	.....	..	.....	45°
Montembo	1880	0	200	600-1,800	150	.....	..	Eocene ss.	20°
Total		0	225		800	.....	..		

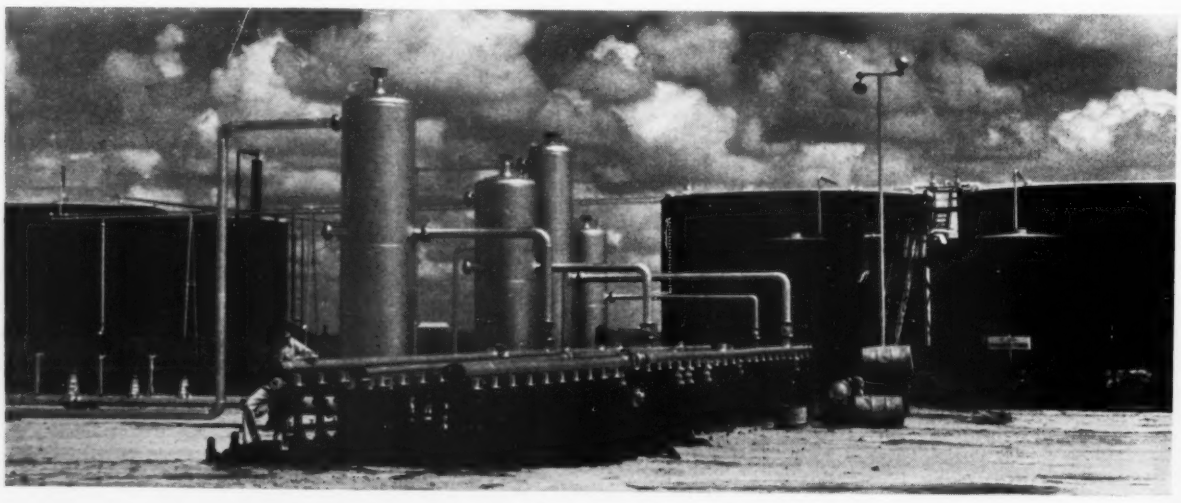
CZECHOSLOVAKIA

Gbley	1913	....	....	500-800	.....	.....	..	Miocene	
Hodonin	....	....	....	.....	.....	.....	..	Miocene	..
Total		....	....		650	4,250,000			

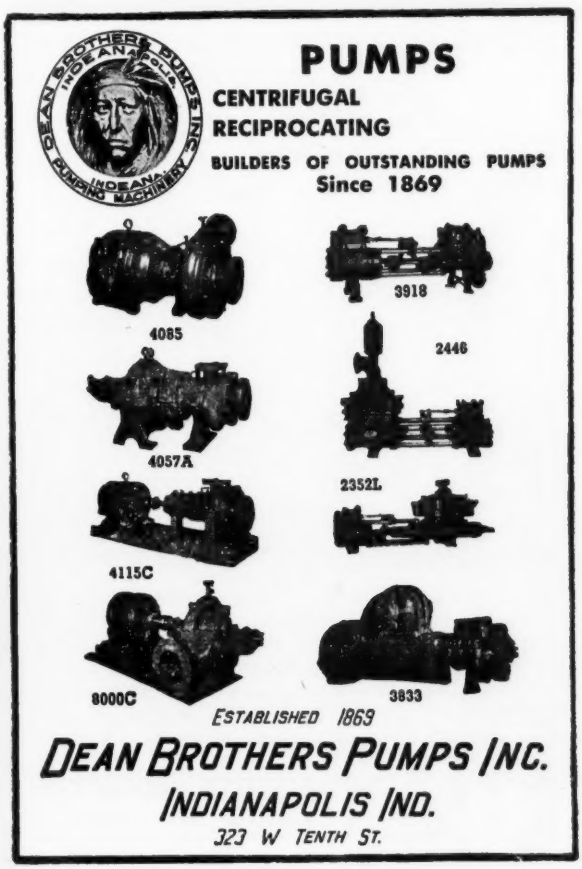
EAST INDIES

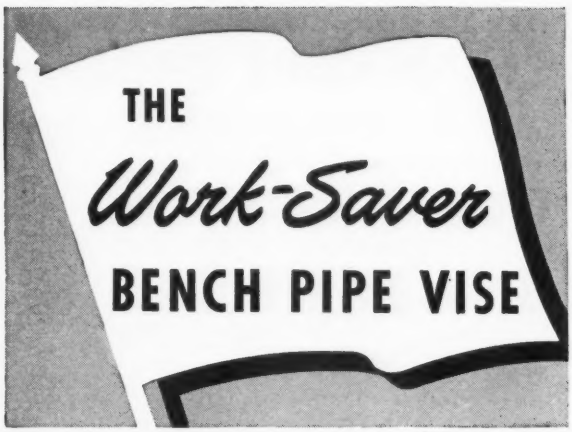
Borneo:									
Miri-Sarawak	1911	1	79	300-3,000	970	70,635,000	1	Tertiary sds.	21°-43°
Seria-Brunei	1929	143	1	1,600-6,400	52,000	69,925,000	3	Tertiary sds.	19°-33°
Tarakan	1906	6	360	195-2,400	7,440	157,022,000	2	Tertiary sds.	20°
Balikpapan District									
Anggana-Mocara	1902	1	37	380-3,200	3,675	59,666,000	..	Tertiary sds.	19°-33°
Sambodja	1910	1	12	160-4,400	840	52,893,000	..	Tertiary sds.	14°-34°
Sanga Sanga	1897	1	39	430-2,900	3,430	142,646,000	..	Tertiary sds.	18°-36°
Southern District									
Tandjoeng	1938	*11	....	2,500-4,300	†200	299,000	2	Tertiary sds.	40°
Total		164	528		68,555	553,086,000	8		

*Shut in. †No pipe-line outlet available; local use only.



Central manifold layout, gas separators, and crude-oil storage, Guico field, eastern Venezuela. This field contains 40 different producing sands and many of the wells are dually or triply completed





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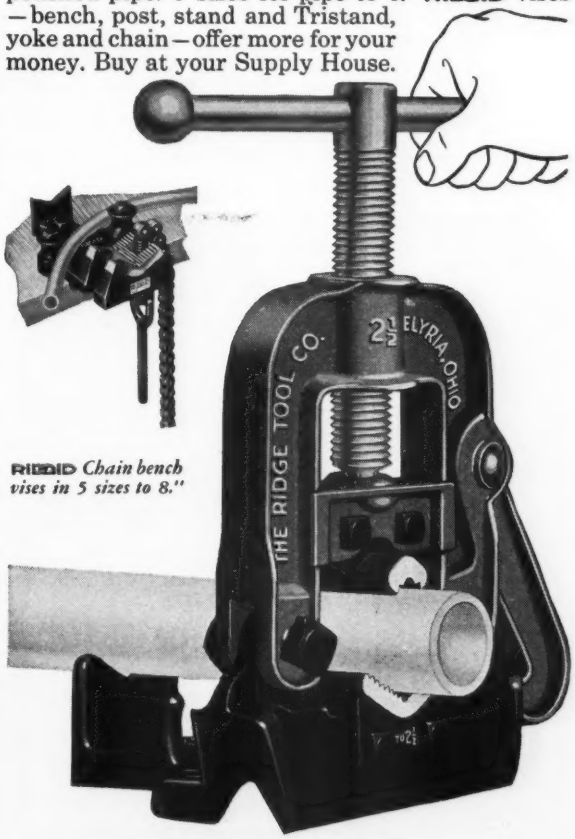

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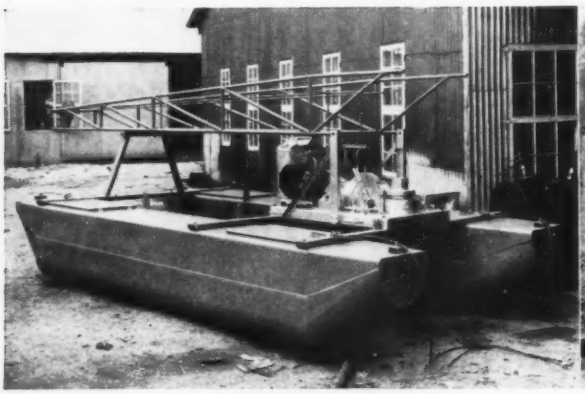

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Rotary: Oil bathed; 3½" opening
Drilling Depth—200 ft.

MINOR CHANGES MADE TO SUIT BUYER

STANDARD EQUIPMENT:
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Wooden lined powder box
Cap box

SPECIFICATIONS:
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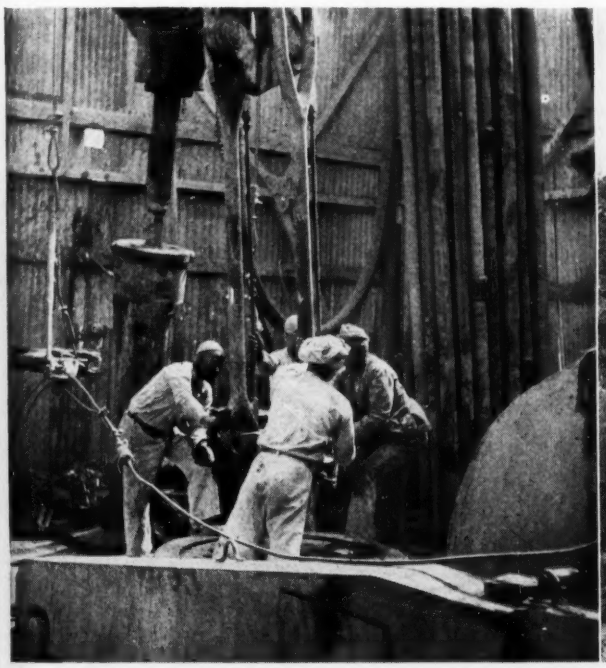
EAST INDIES (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Ceram:									
Boela-Lemoen	1897	(*)	(*)	240-920	(*)	8,203,000	..	Tertiary sds.	23°
*No attempt yet on postwar rehabilitation.									
Java (Rembang District):									
Kawengan	1926	(*)	..	1,750-2,700	(*)	38,972,000	..	Tertiary-sandy marl	35°
Ledok	1896	(*)	..	320-3,200	(*)	21,125,000	..	Tertiary-sandy marl	43°
Soerabaja District									
Kroeka	1929	4	42	970-1,600	1,270	6,608,000	..	Tertiary sds.	30°
Lidak-Koelon	1896	(*)	..	490-1,330	(*)	33,639,000	..	Tertiary sds.	24°
Ngiobo-Semanggi-Banjo-Casin	1897	(*)	..	370-3,350	(*)	18,044,000	..	Tertiary-sandy marl	43°
U. S. Company Fields									
Loesi	1932	(*)	..	Ave. 2,300	(*)	505,000	..	Tertiary sds.	40°
Ngliron	1940	(*)	..	Ave. 6,000	(*)	10,000	..	Tertiary sds.	40°
Petak	1914	(*)	..	Ave. 2,300	(*)	781,000	..	Tertiary sds.	40°
Tremboel	1917	(*)	..	Ave. 2,500	(*)	355,000	..	Tertiary sds.	40°
Total		4	42		1,270	109,769,000	..		
*No attempt yet on postwar rehabilitation, account unsettled political conditions.									
Sumatra:									
Palembang District									
Babat	1901	(*)	..	100-1,050	(*)	8,136,000	..	Tertiary sds.	38°
Karang-Ringin	1903	(*)	..	160-1,200	(*)	1,572,000	..	Tertiary sds.	42°
Mangoendjaja	1935	(*)	..	660-2,200	(*)	9,866,000	..	Tertiary sds.	24°
Kloeang	1914	(*)	..	2,300-2,600	(*)	27,882,000	..	Tertiary sds.	40°
T. Loentar	1912	(*)	..	2,200-2,800	(*)	4,079,000	..	Tertiary sds.	56°
Limau	1928	5	..	5,200-5,450	1,140	5,726,000	..	Tertiary sds.	25°
Talang Djimar	1937	70	..	3,600-4,200	26,200	29,500,000	2	Tertiary sds.	28°
Tandjoeng Tiga	1940	2	..	4,400-4,600	Shut in	None	1	Tertiary sds.	25°
Soeban-Djerigi	1905	1	1	1,300-2,500	780	33,544,000	..	Tertiary sds.	46°
Moeara-Enim (Batoe Kras)	1903	(*)	..	300-1,150	(*)	28,172,000	..	Tertiary sds.	46°
Djambi District									
Badjoebang	1927	(*)	..	2,700-3,100	(*)	24,794,000	..	Tertiary sds.	46°
Betoeng	1923	(*)	..	180-950	(*)	2,100,000	..	Tertiary sds.	40°
Kenneli Aeam	1931	(*)	..	1,700-4,100	(*)	19,204,000	..	Tertiary sds.	22°-46°
Tempino	1931	(*)	..	1,930-2,700	(*)	36,067,000	..	Tertiary sds.	48°
Meroso Senami	1938	(*)	..	2,400-2,650	(*)	93,000	..	Tertiary sds.	48°
Pangkalan Brandan District									
Perlak	1900	(*)	..	160-2,200	(*)	47,870,000	..	Tertiary sds.	57°
Dj. Rajeu	1929	(*)	..	2,520-2,590	(*)	559,000	..	Tertiary sds.	55°
Gebang	1936	(*)	..	2,970-3,480	(*)	135,000	..	Tertiary sds.	54°
Telgara Said-Darat-K. Gadjah	1893	(*)	..	210-720	(*)	23,621,000	..	Tertiary sds.	51°



Left: Native crew on rotary floor of one of the five wells presently drilling in Abqaiq field, Saudi Arabia. With only 44 wells completed so far, this field has produced 121,000,000 bbl. Right: Electrified beam pumper, De Mares concession, Colombia. The twin fields of Infantas-La Cira located here have produced 373,000,000 bbl.

EAST INDIES (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Pangkalan Soesoe	1917	(*)	....	1,550-2,100	(*)	6,287,000	..	Tertiary sds.	56°
Poelo Pandjang	1928	(*)	....	1,640-2,400	(*)	11,243,000	..	Tertiary sds.	55°
Rantau	1929	(*)	....	1,040-2,560	(*)	55,513,000	..	Tertiary sds.	48°
Serangdjaja	1926	(*)	....	3,560-4,150	(*)	7,551,000	..	Tertiary sds.	64°
P. Taboehan	1937	(*)	....	3,300-3,500	(*)	3,283,000	..	Tertiary sds.	52°
U. S. Company Fields									
Talang-Akar-Pendopo	1922	211	....	2,800	31,800	124,180,000	6	Tertiary sds.	38°
Djirak	1930	62	....	1,000	4,000	22,334,000	2	Tertiary sds.	38°
Benakat	1933	87	....	1,600	7,200	38,672,000	..	Tertiary sds.	38°
Seloe	1938	....	....	2,200	.....	47,000	..	Tertiary sds.	38°
N. Pase	1937	....	....	2,000	.....	52,000	..	Tertiary sds.	25°-30°
Radja	1941	....	....	8,000	.....	Drlg. fuel only	2	Tertiary sds.	40°
Lirik	1941	....	....	1,800	.....	242,000	..	Tertiary sds.	34°
Oekoei	1941	....	....	1,800	.....	1,000	..	Tertiary sds.	34°
Total		418	....		71,120	572,325,000	13		
New Guinea:									
Klamono	1936	8	....	300-650	*30	12,000	..	Miocene lime	19°
Mogoi	1940	1	....	1,250	(*)	.....	..	Miocene lime	46°
Wasian	1940	2	....	2,900-3,225	(*)	1,000	..	Miocene lime	48°
Total		11	....		30	13,000			

*Shut in while roads are being built to permit pipe line to be laid to coast.

ECUADOR

Ancon	1920	106	614	800-4,500	4,800	.....	..	Eocene ss.	36°-41°
Tigre	1930	13	12	4,000-5,000	1,860	4,154,000	..	Eocene ss.	38°
Total		119	626		6,660	4,154,000	..		

EGYPT

Ras Gharib	1938	33	50	1,100-2,500	25,000	74,100,000	1	Miocenels; Cret. sd. als., Carboniferous sd.	26°
Sudr	1946	*9	1	2,600-3,000	10,000	1,420,000	1	Eocene ls.; Miocene sd.	23°
Hurghada	1913*	1	49	700-2,200	800	37,500,000	1	Miocene sd. and ls.; Cret. sd.	26°
Asl	1947	1	....	3,800	.....	.....	1	Eocene ls.	22°
Gemsa	1900	1	....	750-1,700	.....	1,300,000	..	Miocene ls.	39°
Total		45	100		35,800	115,320,000	3		

*2 service wells.

ENGLAND

Dukes Wood	1941	....	*113	1,800-2,500	400	1,809,000	..	Upper Millstone grit	33°
Eakring	1939	....	†55	1,800-2,500	200	1,105,000	..	Upper Millstone grit	33°
Kelham Hills	1941	....	‡54	2,000-2,200	170	827,000	..	Upper Millstone grit	28°

*Plus 1 observation well. †Plus 6 water-injection and observation wells. ‡Plus 1 observation well.

Digging ditch for a 16-in. loop recently completed by Northwestern Utilities, Ltd., on its 80-mile gas-transmission system from Viking-Kinsella field to Edmonton, Canada

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NEW YORK LOS ANGELES

ENGLAND (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Caunton	1943		10	2,000-2,200	40	148,000		Upper Millstone grit	28°
Formby	1939		8	85-130	6	58,000		Keuper	35°
Midlothian	1938		2	1,750	3	17,000		Carb.-Dalkieth	40°
Total			242		819	3,964,000			

FRANCE

Pechelbronn	1735		650	100-3,000	1,050	*14,600,000	20	Olig.-Mesozoic	32°
St. Marcet	1939	†10		5,000-6,000	‡370	§30,000	3	Cret. and Jur. limes	§30°
Gabian	1924		6	450	3	220,000		Lower Triassic	35°
Total		10	656		1,423	*14,850,000	23		

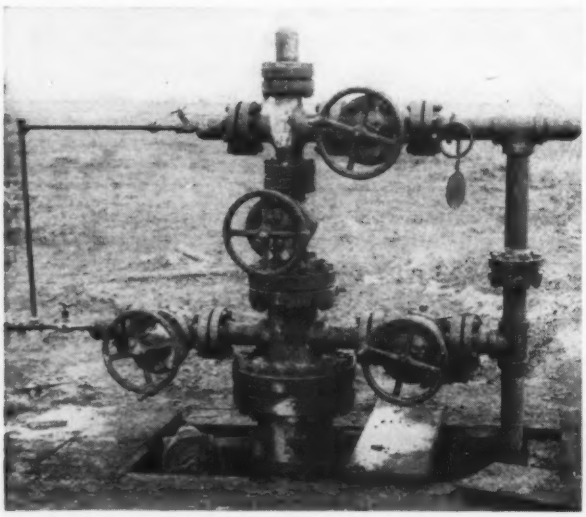
*Since 1919. †Includes 8 gas and condensate wells. ‡Includes 330 bbl. condensate. §Oil only.

FRENCH MOROCCO

Ain Hamra	1918		19	450	15	54,000		Miocene sds.	45°
Dou-Draa	1936		20	300-700	20	160,000		Liasic limes	44°
Oued Beth	1947	3		3,200	300	45,000	3	Pre-Triassic lime type basement	34°
Tselfat	1934		17	300-5,500	10	126,000		Liasic limes	44°
Total		3	56		345	385,000			

GERMANY

Hanover district:									
Broistedt	1937		7	2,400-3,200	90	175,000	1	L. Cret. sd.	33°
Calberlah	1945		7	160-400	7	9,000		Jurassic sd.	19°-22°
Eddesse-Olheim	1876	1	17	2,800-3,300	46	1,225,000		Triassic sd.	32°
Ehra	1939		18	500-820	14	63,000		Jurassic sd.	16°
Eicklingen-Wienhausen	1937		19	1,600-3,100	261	1,668,000		Cret. sd.	32°
Eilte	1947		1	3,700	6	1,000	1	L. Cret. sd.	23°
Etzel	1942		2	4,500-4,700	90	133,000	2	Jurassic lime	13°
Fuhrberg-Hambuchren	1939		181	260-1,950	895	2,480,000	5	Jurassic sd.	23°-25°
Gifhorn	1935		39	660-820	27	275,000		Cret. sd.	17°
Hademstorf	1941		5	4,200-4,400	180	244,000	2	L. Cretaceous	25°
Hohenassel	1943	*2	17	1,200-2,100	365	904,000		Jurassic lime	30°
Moelme	1935	6	63	160-1,800	90	931,000		Cret., Jurassic, Triassic	32°
Nienhagen-Hanigsen	1899		221	600-5,350	2,440	29,266,000	1	Jurassic and Cret.	22°-40°
Oberg	1919		63	500-1,900	130	1,957,000		L. Cret. and Jurassic	38°-40°
Steimbke-Rodewald	1936	*4	125	800-2,200	740	2,850,000		L. Cret. and Jurassic	19°
Stemmerberg	1948		1	2,600	2			Jurassic sd.	25°
Thoren	1941	1	48	1,500-4,000	310	856,000	3	Cret., Jurassic, Triassic	19°-35°
Wesendorf	1943	19	3	2,600-6,000	940	1,450,000	5	Jurassic sd.	35°
Wietse	1874		305	300-1,080	380	10,560,000		Cret., Jurassic	18°-27°
Emsland district:									
Emlichheim	1944	1	18	2,400-2,900	1,280	798,000	3	Cretaceous sd.	25°
Georgsdorf	1944	30	3	1,600-3,300	840	515,000	5	Cretaceous sd.	24°
Adorf	1946	1		4,000-4,400	75	3,000	1	Cretaceous sd.	30°
Lingen	1942		43	2,800-3,800	880	995,000	4	Cret. sd., Jurassic lime	30°-32°
Baden district:									
Forst-Weiher	1934		46	1,200-2,500	83	508,000	1	Tertiary, Jurassic, Triassic	32°-34°



Left: Typical well hookup in Leduc field, Canada. The field, discovered in February 1947, now has more than 135 producing wells. Right: Discovery well of the new Redwater field, 35 miles northeast of Edmonton. Drilled by Imperial Oil, Ltd., the well is producing from Devonian at depth of 3,200 ft. A second well now has been completed, four others are drilling in area

GERMANY (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Weingarten	1936	....	55	800-1,600	37	243,000	1	Tertiary sds.	32°-36°
Schleswig district:									
Heide	1935	*1	50	2,500-4,500	920	8,370,000	5	L. Cret. and Paleozoic	31°
Hamburg district:									
Meckelfield	1938	....	29	1,000-1,670	35	310,000	....	U. Cret. lime; L. Cret. sd.	24°
Reitbrook	1937	†75	45	1,400-2,600	710	8,000,000	....	Tertiary sd.; Cret. lime	21°-23°
Total		141	1,431		11,873	74,789,000	40		

*Service wells. †Includes 4 service wells.

HUNGARY

Budafapustza	1937	68	9	3,500-3,900	3,020	16,424,000	2	Pliocene-L-Pannonian	38°
Lovaszi	1940	97	1	3,950-4,900	6,300	21,277,000	2	Pliocene-L-Pannonian	43°
Hahot	1942	3	2	4,675-4,900	1,020	3,287,000	....	Pliocene-L-Pannonian	30°
Ujfalu	1941	....	....	2,000	....	10,000	....	Pliocene-L-Pannonian	40°
Bukkszek	1937	....	....	250-4,500	....	90,000	....	Oligocene	
Total		168	12		10,340	41,088,000	4		

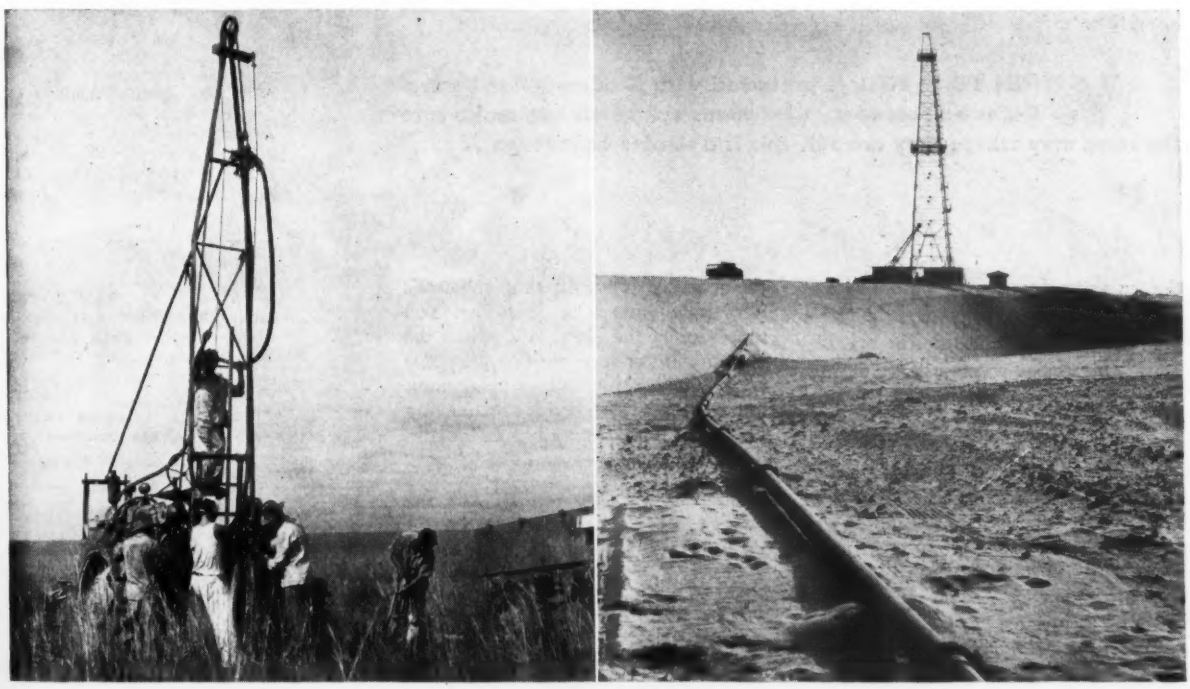
INDIA

Digboi	1890	365	260	500-5,000	5,100	42,200,000	....	Miocene-Tipam ss.	36°

IRAN

Agha Jari	1937	†12	....	6,000-9,000	200,000	125,500,000	3	Asmari ls.-Olig.-Miocene	35°
Haft-Kel	1928	‡37	....	3,000-4,000	190,000	*787,100,000	....	Asmari ls.-Olig.-Miocene	38°
Naft-i-Safid	1938	§5	....	5,500	....	12,800,000	1	Asmari ls.-Olig.-Miocene	40°
Masjid-i-Sulaiman	1908	¶74	....	2,000-3,000	*90,000	*804,600,000	....	Asmari ls.-Olig.-Miocene	38°
Lali	1946	§4	....	6,500	....	600,000	2	Asmari ls.-Olig.-Miocene	37°
Gach Saran	1937	§6	....	4,000-7,000	40,000	83,100,000	....	Asmari ls.-Olig.-Miocene	33°
Naft-i-Shah	1923	‖3	....	2,600-2,700	*3,000	*10,200,000	....	Asmari ls.-Olig.-Miocene	43°
Pazanum	1937	3	....	6,000-8,000	Shut in	6,500,000	....		66°
Total		144	....		523,000	1,830,400,000	6		

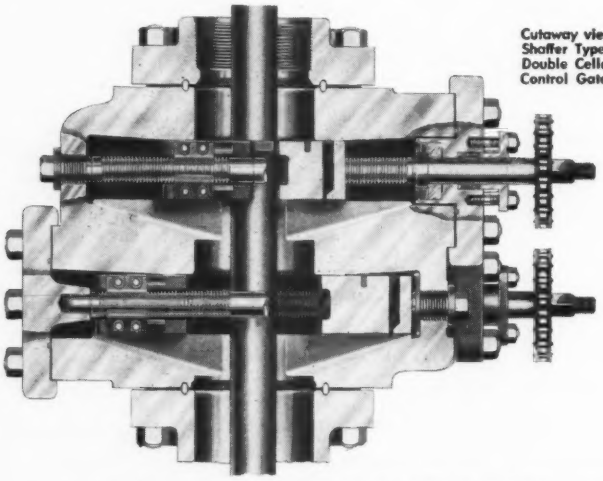
*Net production after deducting recycled products. †2 observation wells. ‡18 observation wells. §3 observation wells. ¶46 observation and fuel-oil recycle wells. ‖1 fuel-oil recycle well.



Left: Llanos country, western Venezuela. This is swampy terrain during the wet season, so the seismograph shot-hole drill shown is mounted on balloon-tire tractor. Right: Saudi Arabia—shifting sands built up this remarkable ridge near one of Arabian American Oil Co.'s drilling rigs

Close it AND IT STAYS CLOSED!

Open it AND IT STAYS OPEN!



Cutaway view of Shaffer Type 45 Double Cellar Control Gate

The rams in a SHAFFER GATE stay wherever they are set...

without locking devices of any kind

WHEN YOUR WELL is protected with Shaffer Cellar Control Gates no secondary operations are needed to make sure the rams stay where they are set. This is a *double* advantage...

When the gate is closed

the rams stay closed *automatically* without need for anyone to go near the gate to "lock" it or for other closing operations. This not only saves vital time in emergencies but also eliminates risk of forgetting any locking operations—*because none are necessary!*

When the gate is open

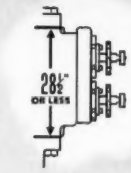
the operation is equally simple. There's nothing to unlock or disengage. You simply open the Gate. And when the rams are in the open position, they *stay* open automatically. No creeping rams to block the hole—no risk of damaging the rams when running bits or tools in or out of the well!

This Shaffer feature of positive ram operation is one more of *so many* vital Shaffer advantages that no operator should fail to get the *complete* Shaffer story before purchasing any cellar control gate equipment. Let us give you further details on the multiple Shaffer Cellar Control Gate advantages, a few of which are highlighted at right.

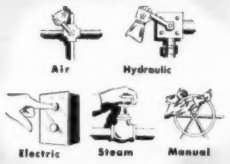
Write for your free copy of the Shaffer Catalog.

See pages 3843 to 3894 of your 1948 Composite Catalog for data on the complete Shaffer line.

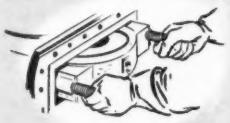
YOU GET VITAL ADVANTAGE LIKE THESE IN SHAFFER CELLAR CONTROL GATES!



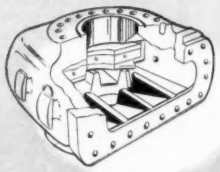
GREATER COMPACTNESS — *cellar sa ing compactness that permits clos hook-ups, reduces cellar dimension saves time and money on every i installation throughout life of Gat*



MAXIMUM POWER ADAPTABILITY – *choice of air, hydraulic, steam or electric power drives — plus full manual standby — is yours with Shaffer Gates. All drives are compact, simple, positive, quick!*



EASY RAM CHANGES — *only one end cover need be removed to change both sides of ram assembly. Saves time, saves work!*



MUD FREE OPERATION — *bottoms of Shaffer ram compartments are sloped sharply downward, with rams travelling on high narrow ribs. Mud drains quickly out of Gate — does not interfere with free operation of rams!*

Plus **MANY OTHER VITAL SHAFFER ADVANTAGES. No other cellar control gate has so many important operating features . . . requires so little cellar space . . . is so trouble-free and dependable on all modern drilling programs!**

25 years OF OIL TOOL LEADERSHIP

SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

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EXPORT SALES OFFICE: Shaffer Tool Works, 500 Fifth Avenue, New York, N. Y., U.S.A.

IRAQ

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Kirkuk	1927	*29	....	Ave. 2,750	80,000	374,000,000	2	Quarah Chauq ls., Eocene-Mio.	36°
Naft Khaneh	1923	†4	....	3,000	7,000	27,700,000	..	Kalhur ls.; Olig.-Miocene	43°
Total		33	....		97,000	401,700,000	2		

*9 observation wells, 8 shut-in wells. †2 observation wells.

ITALY

Vallezza	1909	....	155	1,600-2,400	80	925,000	..	Oligocene-Tongrain	50°
Centopozzi-Salsominore	1923	....	64	500-1,600	15	499,000	..	Oligocene-Tongrain	42°
Vizzola	1924	....	4	1,900	5	18,000	..	Pliocene-Piacentian	31°
Total		....	223		100	1,442,000	..		

JAPAN

Hokkaido district	1905	....	407	.....	60	1,630,000	..	Tertiary	
Akita district	1902	18	1,292	300-3,300	1,420	28,000,000	..	Tertiary	21°-40°
Yamagata district	1922	3	249	2,600-5,000	580	6,350,000	..	Tertiary	27°-37°
Niigata district	1874	7	1,958	1,000-4,500	730	44,300,000	..	Tertiary	17°-35°
Shizoku district	1908	....	5	.....	10	1,000	..	Tertiary	..
Total		28	3,911		3,400	80,281,000	..		

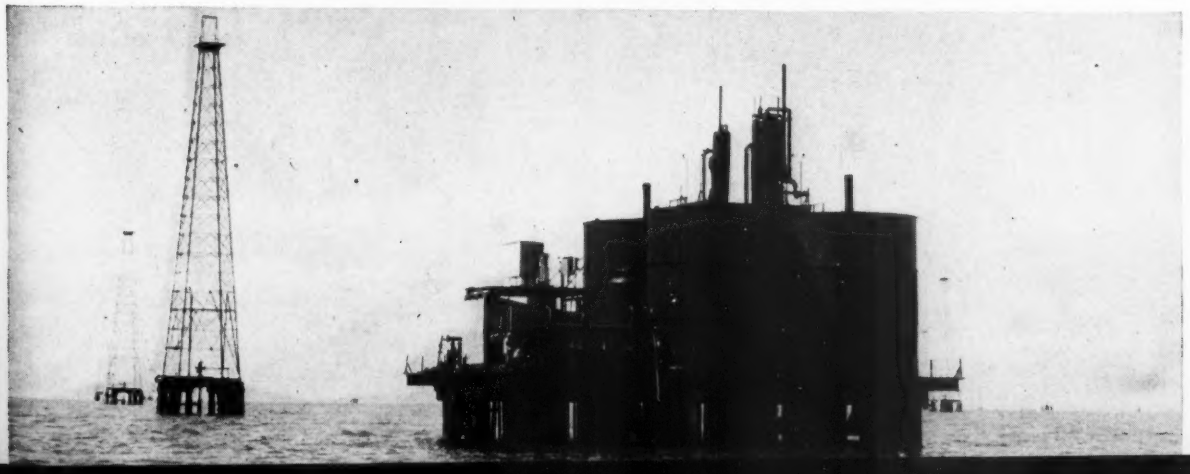
KUWAIT

Burgan	1938	22	....	Ave. 4,700	135,000	33,000,000	6	Middle and Lower Cretaceous sands	32°

MEXICO

Northern zone:									
Camargo	1947	*2	....	2,165	.....	.....	..	Marine, Vicksburg, Eocene	..
Mision	1945	*4	....	5,840	†30	30,657	..	Marine, Vicksburg, Eocene	..
Northern district (Ebano, Panuco, etc.)	1901	568	....	1,148	29,789	796,155,440	5	Fractures into the first 800 ft. of the Tamaulipas and San Felipe limestones, L. Cretaceous	12°
Southern district (Golden Lane)	1908	198	...	2,200	21,040	1,080,937,968	..	El Abra Reef-phase limestone L. Cretaceous	20°
(Moralillo)	1948	1	....	5,305	506	79,786	2	El Abra Reef-phase limestone L. Cretaceous	21°
Poza Rica	1930	64	....	7,250	96,123	310,424,922	5	Tamabra limestone, L. Cretaceous	30°
Other fields (San Sebastian, Tanhuijo, Mecatepec, Furbero)	....	1	....	....	51	4,153,975	..	.....	..
Southern zone:									
Cuichapa	1934	3	6	2,100	700	2,200,043	..	Encanto sand, Miocene	30°
Acalapa	....	3	....	....	608	42,755	1	.....	..
El Burro	1930	....	30	2,460	1,359	17,009,707	1	L. Concepcion and Encanto sands, Miocene, Cedral, Lignitic, U. Concepcion lime	26°
El Plan	1931	63	14	5,734	11,022	63,792,485	3	Concepcion, Filisola, and Encanto sands, Miocene	24°-35°

On Lake Maracaibo are installed some of the largest (high in-and-out rate) tank batteries in the world. Equipped with centrifugal pump-electric motor units, they discharge to shore up to 55,000 bbl. per day through submarine pipe lines



MEXICO (Continued)

Name of field—	Year of discovery	No. of prod. wells Flowing	No. of prod. wells Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Filisola	1921		38	1,585	743	21,156,585		Encanto sands, Miocene	22°
Teapa Nuevo	1928		3	429	21	222,259		Encanto sands, Miocene	36°
Tonala	1928	1	72	1,640	2,318	45,558,516		L. Concepcion and Encanto sands, Miocene and Deposito sds., Olig.	28°
Other fields (San Cristobal, Capoacan, Concepcion, Tecuanapa, Ixhuatlan, Sarlat, Belem, etc.)		3							
Total		911	163		164,310	2,352,142,299	17		

*Gas wells. †Distillate.

NETHERLANDS

Schoonebeck	1943	1	46	2,500-2,700	9,450	3,360,000	1	L. Cretaceous sd.	25°

PAKISTAN

Khaur	1915	(*)		To 5,200	(*)	Over 4,000,000		Eocene and Upper Tertiary sds.	37°
Dhulian	1937	(*)		To 7,600	(*)	Over 5,000,000		Eocene lime	35°
Joya Mair	1944	2		To 7,000	Shut in	Not available		Eocene lime	22°
Balkassar	1946	3		To 8,200	(*)	Not available	1	Eocene lime	26°
Total		(*)			1,260		1		

*Records incomplete account exodus Hindu staff due to political troubles.

PERU

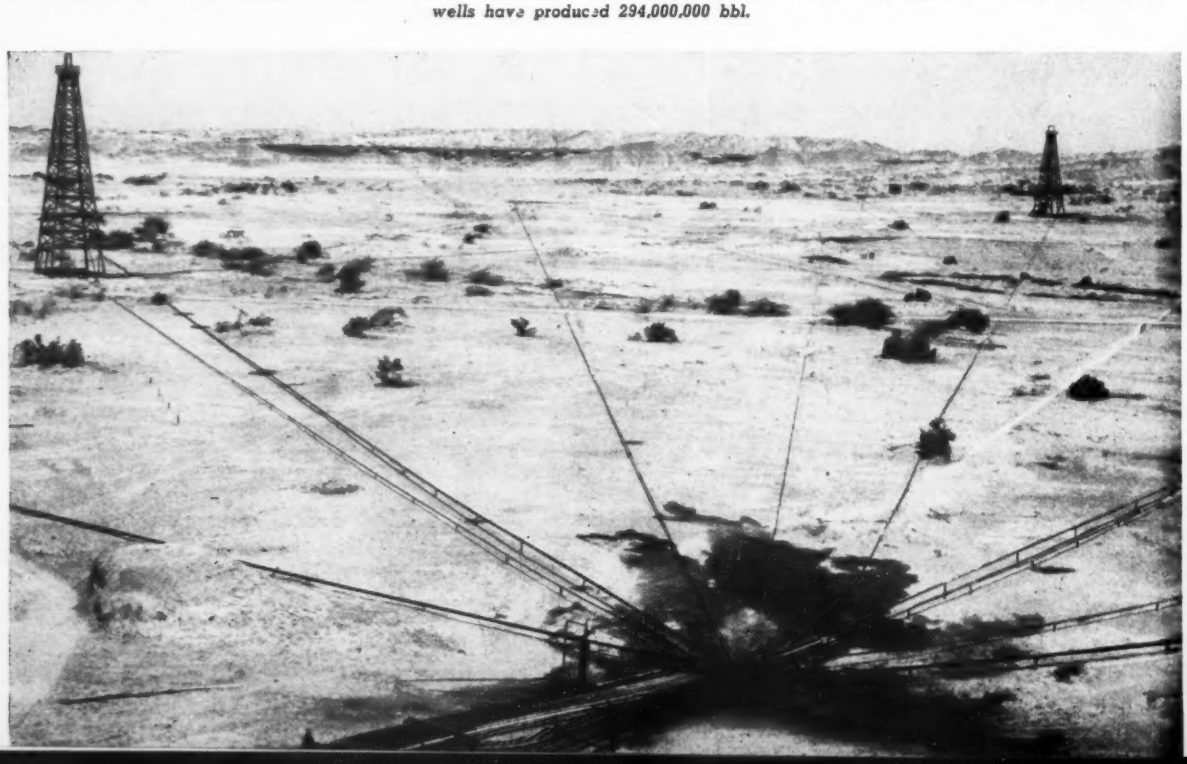
Agua Caliente	1937	6	0	1,000-1,080	2,500	410,000		L. Cretaceous sd.	43°
El Alto and Restin	1911	49	634	1,500-6,500	4,600			Eocene ss.	34°-39°
Lobitos	1902	32	204	2,000-6,500	2,200			Eocene ss.	34°-39°
La Brea-Parinas	1888	*254	1,961	500-7,000	31,000	294,181,000	14	Eocene ss.	34°-38°
Total		341	2,799		40,300	294,591,000			

*Includes 53 service wells.

POLAND

Gorlice-Lipinski	1865		750		550				
Grabownica	1896		90		320				
Wankowa	1885		380		300				
Turaszowka			55		280				
Bobrka	1858		103		210				
Harklowa	1870		160		120				
Zmiennica	1896		55		120				
Miscellaneous	Various		757		500				
Total			2,350		2,300				

Talara, Peru.—This is a panoramic view of oil and gas lead lines from one small part of the huge La Brea-Parinas estate. The 2,200 plus wells have produced 294,000,000 bbl.



QATAR

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Dukhan	1940	*2	....	5,000-6,000	Shut in	.....	1	Jurassic, Kerkrit lime	36°

*Shut-in wells.

ROMANIA

Baicoi*	1861	....	....	600-9,800	17,100	.....	..	Pliocene-Dacic and Meotic	39°
Boldesti	1922	....	....	6,900-7,900	8,000	.....	..	Pliocene-Dacic and Meotic	37°
Bucsani	1933	....	....	6,500-7,300	140	.....	..	Pliocene-Dacic and Meotic	38°
Ceptura	1913	....	....	2,400-4,100	8,400	.....	..	Pliocene-Dacic and Meotic	34°
Cura Ocnitei†	1929	....	....	5,400-5,900	24,000	.....	..	Pliocene-Dacic-Miocene	33°
Margenini	1935	....	....	6,100-7,500	180	.....	..	Pliocene-Dacic (Helvation)	39°
Moreni‡	1903	....	....	1,400-5,600	12,100	.....	..	Pliocene-Meotic-Dacic	33°
Piscuri§	1927	....	....	1,200-4,000	430	.....	..	Pliocene-Meotic	33°
Floresti‖	1933	....	....	6,900-7,500	50	.....	..	Pliocene	39°
Pascureti	1899	....	....	2,000-4,000	40	.....	..	Pliocene, Dacic, Pontic, Meotic	52°
Miscellaneous¶	.....	....	....	.....	.....	.....	..	.....	..
Total	.....	....	....		70,440	1,185,000,000	..		

*Includes Liliesti and Tintea. †Includes W. Gura Ocnitei, Ochjuri and Rasvad. ‡Includes Ghirdoventi. §Includes Filipesti de Padure. ‖Includes Ditesti and Galinesti. ¶Production from abandoned properties.

SAUDI ARABIA

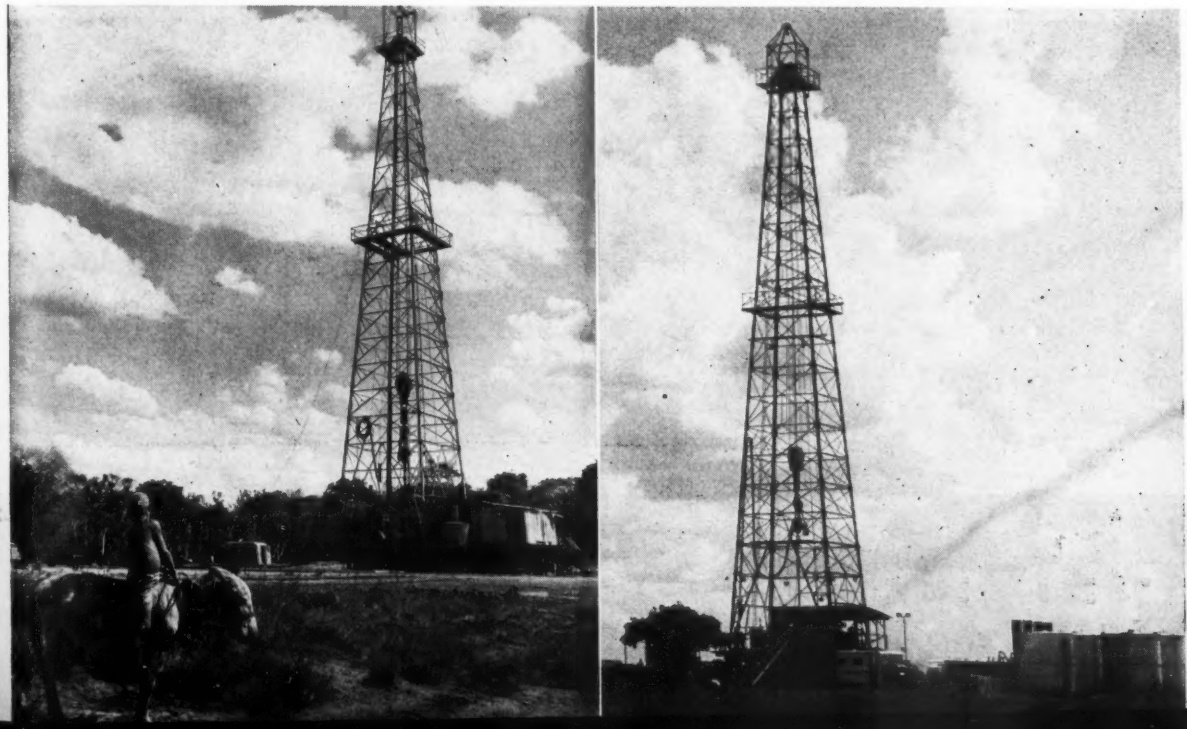
Abqaiq	1941	†28	*16	6,800	285,000	121,000,000	5	Arab Zone Upper Jurassic ls.	37°
Dammam	1938	33	*1	2,000-4,800	92,000	140,000,000		.....	35°
Ain Dar	1948	1	..	6,900	Comp. 7-15-48	.....	1	.....	32°
Abu Hadriya	1940	....	*1	10,000	Shut in	10,000	1	Honifa, Middle	35°
Qatif	1945	4	....	7,300	5,000	4,200,000	1	Arab, Upper	30°-36°
Total	.....	66	18		382.000	265,210.000	8		

*Shut-in wells. †1 service well.

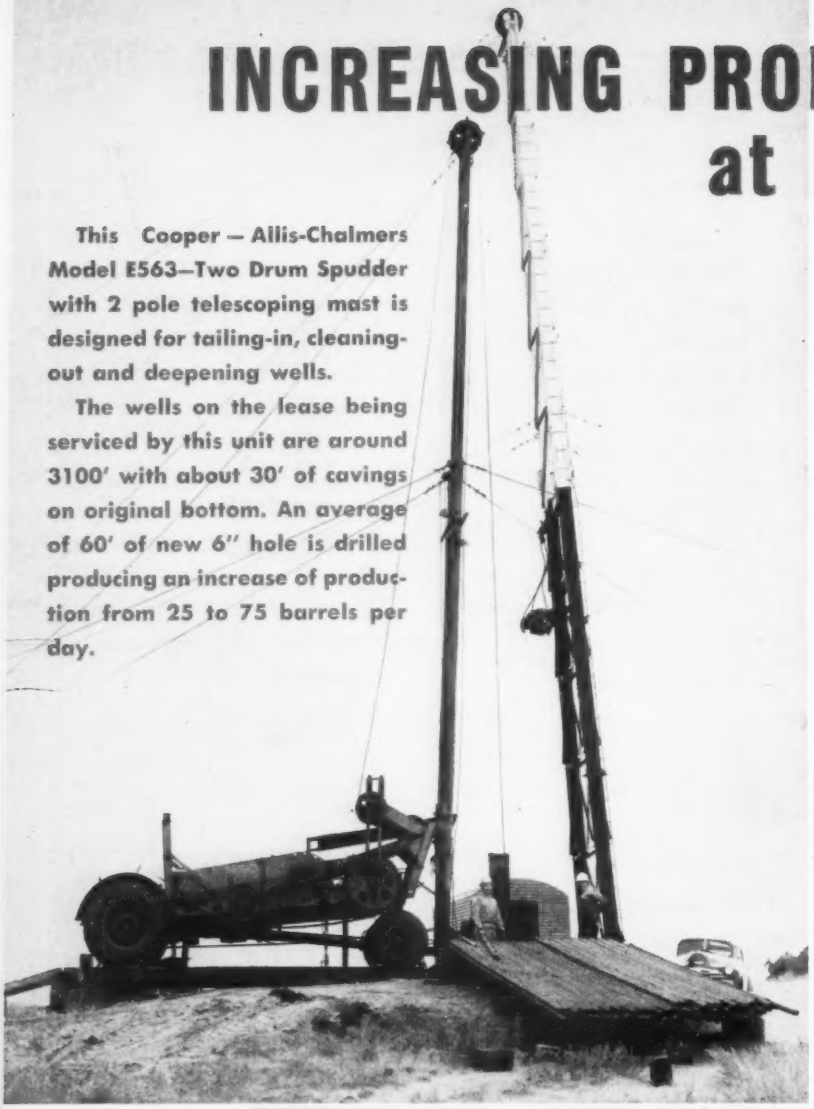
TRINIDAD

Barrackpore	1918	11	53	500-5,000	1,790	6,680,000	1	Barrackpore and Wilson sd.-Mio.-Olig.	27°
Brighton	1910	14	31	700-3,000	980	6,305,000	..	Forest sd.-Miocene	18°
Coora-Quarry	1936	95	130	1,200-6,500	600	.....	..	Forest and Cruse sds.	26°
Cruse	1913	35	56	2,000-4,000	1,970	14,558,000	..	Cruse sd.-Miocene	21°
Forest Reserve	1914	*140	233	500-6,000	16,000	88,909,000	3	Forest and Cruse sd., Miocene	24°

Left: Small Venezuela boy looks over one of the big rotaries in Jusepin field, eastern Venezuela. There are 335 flowing wells and two pumpers so far. Right: This is Rig No. 6 of Socony-Vacuum Oil Co., Inc., Guico district, eastern Venezuela



INCREASING PRODUCTION at Less Cost



This Cooper — Allis-Chalmers Model E563—Two Drum Spudder with 2 pole telescoping mast is designed for tailing-in, cleaning-out and deepening wells.

The wells on the lease being serviced by this unit are around 3100′ with about 30′ of cavings on original bottom. An average of 60′ of new 6″ hole is drilled producing an increase of production from 25 to 75 barrels per day.

Doing the Job as Specified

The use of the AC tractor unit in the rough Panhandle country enables the crew to move to the location, set-up the substructure, spot the spudder and be ready to run in a half day.

The unit is made ready to move to the next location, under its own power, in about an hour.

Several models of Cooper — Allis-Chalmers Tractors and Skid type spudders are available. Air controls are now standard on these units.

Write for complete information.

FRED E. Cooper, Inc. TULSA, OKLA

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TRINIDAD (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depths	Daily avg. production (bbl.)	Accumulated production 7-1-48 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Fyzabad	1920	138	246	300-8,000	9,300	81,575,000	3	Forest and Cruse sd., Miocene	24°
Guapo	....	141	190	1,500-5,700	10,850	68,500,000	..	Forest and Cruse sd., Miocene	24°
Guayaguayare	1902	20	53	500-4,000	1,130	8,397,000	..	Forest and Cruse sd., Miocene	31°
Morne Diablo	1936	0	21	2,500-4,000	360	2,171,000	..	Forest and Cruse sd., Miocene	25°
Quinam	1936	3	10	1,500-4,000	300	1,155,000	..	Forest and Cruse sd., Miocene	31°
Palo Seco	1934	7	46	1,500-5,000	650	3,874,000	..	Forest and Cruse sd., Miocene	21°
Parrylands	1913	18	12	2,000-4,000	1,100	19,710,000	..	Miocene	26°
Penal	1935	44	34	1,300-8,500	8,300	15,165,000	3	Mio.-Olig. sds.	23°
Point Fortin	1908	133	94	1,000-6,800	7,800	55,322,000	3	Miocene sds.	18°-22°
San Francique	1922	0	18	1,000-2,800	240	4,775,000	..	Miocene sd.	23°
Wilson	1918	9	25	500-3,500	130	2,932,000	..	Mio.-Olig. sds.	21°
Total		808	1,199		59,710	373,348,000	13		

*Includes 4 service wells.

TURKEY

Ramandag	1948	....	....	4,400	150	.....	..	.....	..

VENEZUELA

Cabimas	1917	191	764	2,198	8,800	57,108,000	1	Miocene-Oligocene	21°-25°
Tia Juana	1928	218	458	3,001	180,500	521,827,000	5	Miocene-Oligocene	12°-26°
Lagunillas	1926	274	1,045	3,001	346,100	1,579,468,000	3	Miocene-Eocene	17°-26°
Pueblo Viejo	1940	18	3	1,968	42,700	7,515,000	1	Eocene	18°-20°
Bachaquero	1930	459	23	3,444	115,700	105,350,000	9	Miocene	13°-15°
Mene Grande	1914	66	208	4,132	46,200	312,757,000	2	Eocene	16°-21°
Amana	1928	...	..	3,280	.....	38,000	..	Eocene	31°
Mara	1945	11	0	5,248	39,100	20.879.000	10	Cretaceous	30°
Netick	1929	2	0	8,268	300	575,000	..	Eocene	39°
La Paz	1925	26	14	4,264	116,400	81.886,000	3	Eocene-Cretaceous	34°
La Concepcion	1935	4	86	3,148	2,600	31.775,000	..	Eocene	36°
El Cubo	1916	27	102	984	12,200	10.683,000	.	Eocene	32°-41°
El Mene	1921	7	15	984	400	24.629,000	..	Oligocene	33°
Hombre Pintado	1927	0	18	1,968	600	825,000	..	Oligocene	24°
Cumarebo	1931	9	12	1,968	4,200	40.009,000		Miocene	47°
Las Mercedes	1942	104	0	4,264	5,300	623,000	9	Mio.-Olig.-Cret.	29°
Tucupido	1946	2	0	5,576	...	9.000	1	Miocene	41°
Quiamare	1942	1	0	6,396	37	628,000	..	Miocene-Oligocene	38°
La Ceiba	1945	1	0	7,872	200	145,000	..	Oligocene	36°
Santa Rosa	1941	7	0	7,380	2,700	4,256,000	3	Mio.-Olig.-Eocene	44°
El Roble	1939	15	0	9,446	5,300	1,738,000	3	Miocene-Oligocene	58°
Guario	1940	20	0	5,248	6,100	8,096,000	..	Miocene-Oligocene	44°
San Joaquin	1939	34	0	6,560	5,800	23,598,000	2	Miocene-Oligocene	44°
Santa Ana	1936	3	0	8,265	500	1,351,000	2	Mio.-Olig.-Eocene	39°
Rincon Largo	1936	4	0	7,708	1,900	278,000	..	Miocene-Oligocene	43°
Nipa	1946	41	0	7,544	21,900	76,094,000	9	Miocene	35°-39°
Guico	1944	45	0	6,068	17,800	17,623,000	1	Miocene	39°
Guara	1942	167	9	4,920	75,500	95,571,000	4	Miocene-Oligocene	38°
Leona	1938	19	2	5,904	6,600	7,640,000	2	Miocene-Oligocene	29°
Oficina	1937	146	71	5,116	41,800	130,629,000	..	Miocene-Oligocene	32°
Yopales	1937	9	1	4,165	1,000	1,202,000	1	Miocene-Oligocene	21°
Merey	1934	1	1	4,493	600	81,000	1	Pleistocene	24°
Caico Seco	....	3	0	6,560	500	234,000	..	Miocene-Oligocene	43°
Chimire	....	3	0	754	500	55,000		Miocene-Oligocene	24°
Pelayo	....	1	0	820	100	34,000	1	Miocene-Oligocene	40°
Quiriquire	1928	85	230	3,280	67,700	290,339,000	5	Pliocene	18°
Jusepin	1938	335	2	4,264	42,200	100,124,000	..	Miocene-Oligocene	32°
Mulata	1941	168	5	4,592	20,800	21,542,000	..	Miocene	33°
Santa Barbara	1941	238	14	5,641	26,900	60,986,000	2	Miocene	32°
Mata Grande	1946	16	0	4,592	1,600	487,000	1	Miocene-Oligocene	22°
Pirital	1945	1	0	2,460	31	76,000	..	Miocene-Oligocene	30°
Los Caritos	1939	0	0	5,641		255,000	..	Miocene-Oligocene	30°
Temblador	1936	75	0	3,804	9,600	26,471.000	2	Miocene-Oligocene	21°
Tabasca	1936	0	0	4,198	.....	45,000	1	Miocene	21°
Pedernales	1933	2	0	1,571	2,400	9,929,000	1	Miocene	21°
Tucupita	1945	31	0	5,608	6,400	2,780,000	3	Miocene	17°
Las Palmas	1929	0	0	....	.....	433,000	..	.....	32°
Las Ollas	1940	0	0	7,544	.....	4,000	..	Miocene	24°
Capacho	1945	0	0	4,428	.....	7,000	..	.....	23°
Anaco	1940	0	0	11,152	.....	7,000	..	Miocene-Oligocene	47°
Socororo	1939	0	0	3,936	.....	12,000	..	.....	27°
Concesion Lacustre	....	0	0	....	.....	2,000	..	.....	..
Aero	1934	0	0	4,264	.....	4,000	..	Pleistocene	13°
Orocual	1935	0	0	3,181	.....	29,000	..	Miocene-Pliocene	14.°
El Totumo	1914	0	0	....	.....	24,000	..	.....	22°
Guanoco	1913	0	0	328	.....	1,719,000	..	Upper Cretaceous	..
Fria	....	4	0	5,576	1,100	130,000	..	Miocene	..
El Toco	....	2	0	7,544	1,500	97,000	2	Eocene	..
Total		2,895	3,073		1,290,168	3,680,711,000	90		

YUGOSLAVIA

Peklenco-Selencia	1942	....	....	4,000-4,200	1,000	2,700,000	..	.....	..

World Refining Capacity Is Rapidly Approaching 10,000,000 Bbl. Daily

by R. B. Tuttle

THE world capacity to refine crude oil into marketable products is rapidly approaching 10,000,000 bbl. daily.

Including new refineries and expansion of existing facilities now under construction or definitely authorized, the world capacity of more than 650 widely scattered plants exceeds the 10-million-daily total. Furthermore, before 1949 ends, additional projects will be announced and actual construction started so that mounting world demands may be met.

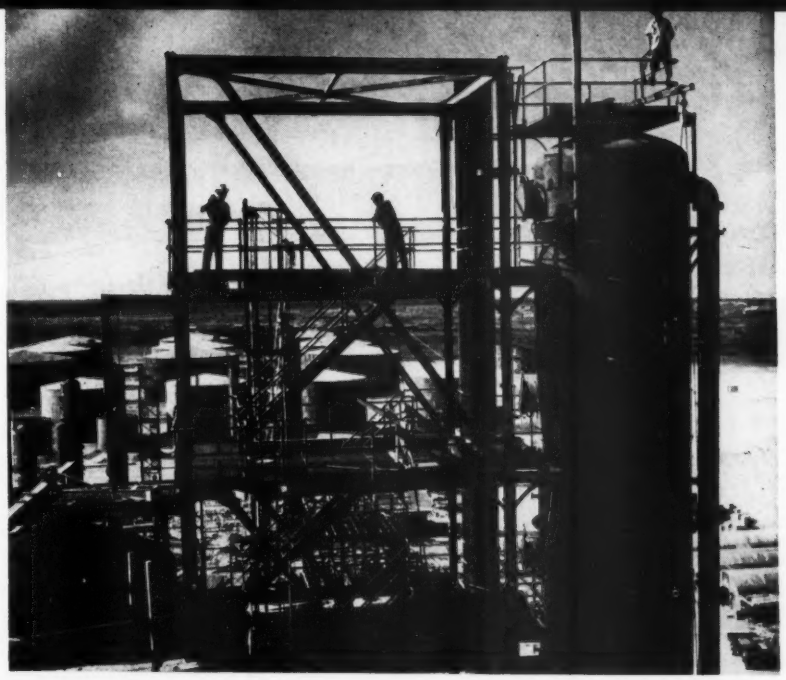
The situation on world refining as of today is summarized in the accompanying table.

World crude-oil capacities of the 637 refineries listed in the table for 1948 is slightly more than 9 million barrels daily. Excluding Russia and its controlled countries, approximately 69 per cent of the world capacity at the beginning of 1949 is in North America. This capacity, amounting to nearly 6.5 million barrels daily, is provided by 431 individual refineries, approximately 68 per cent of the world's total number of plants.

Capacity at the end of 1949 is scheduled to be near the 10-million mark. The number of new plants expected to be completed before the beginning of 1950 will raise the world's total to more than 650. During the year 1950 all projects cur-

World Refining Capacity by Continents

	1940			1948			1949 - 1950*		
	No. of refineries	Capacity, bbl. per day		No. of refineries	Capacity, bbl. per day		No. of refineries	Capacity, bbl. per day	
AFRICA:		Crude oil	Cracking		Crude oil	Cracking		Crude oil	Cracking
Canary Islands	1	5,000	4,100	1	10,000	5,000	1	10,000	5,000
Egypt	2	17,000	4,100	2	37,750	7,000	2	37,750	7,000
Total	3	22,000	8,200	3	47,750	12,000	3	47,750	12,000
ASIA:									
Burma	3	23,000	3,000	2	4,000		2	4,000	
China	†1	3,000	900	2	9,500		2	17,850	
East Indies:									
Borneo-Java	4	52,000	8,000	4	14,000	2,000	4	14,000	2,000
Sarawak	1	20,000		1	35,000		1	35,000	
Sumatra	3	108,000	20,500	4	148,600	38,700	4	166,600	38,700
India	4	14,000	7,600	1	5,750	1,500	1	5,750	1,500
Japan	17	48,600	13,800	7	16,300		7	16,300	
Middle East:									
Bahrein Island	1	32,500	12,000	1	145,000	24,600	1	150,000	24,600
Iran	3	333,000	155,000	2	502,100	125,000	2	502,100	125,000
Iraq	2	4,000		2	9,000		2	9,000	
Palestine	1	40,000	20,000	1	83,000	33,000	1	86,000	33,000
Saudi Arabia	1	3,000		1	120,000	20,000	1	131,000	20,000
Pakistan	1	4,000	2,500	1	4,800	2,000	1	4,800	2,000
Total	42	685,100	243,300	29	1,097,050	246,800	29	1,142,400	246,800
AUSTRALIA:									
Total	3	4,100	1,000	2	9,000		4	15,200	
EUROPE:									
Austria	5	8,000	800	8	18,970	4,000	8	18,970	4,000
Belgium	7	12,200	2,300	6	11,600		6	11,600	
Denmark	1	500		3	620		3	620	
Eire	2	10,600		1	650		1	650	
France	18	151,600	72,900	14	142,100	50,500	15	300,100	50,500
Germany	31	48,400	6,100	22	39,000	9,520	26	65,130	9,520
Great Britain:									
England	12	67,800	11,000	12	108,850	10,000	12	108,850	10,000
Scotland	4	23,200	6,000	3	19,300	3,000	3	19,300	3,000
Wales	1	22,000	3,500	1	17,000	4,000	1	62,000	4,000
Hungary	7	11,700	300	8	23,100	350	8	23,100	350
Italy	8	48,800	28,600	7	54,400	16,000	7	54,400	16,000
Netherlands	1	15,000	12,500	1	7,000	15,500	2	27,000	21,900



View of 40,000-bbl. refinery of Shell Caribbean Petroleum Co. under construction at Punta Cordon, Paraguayan Peninsula, Venezuela

rently under way or authorized will have been completed according to schedules now established. Completion of these scheduled projects will step up world capacity to 10,150,520 bbl. daily for 653 refineries.

The projects planned but not yet authorized for further expanding world refining capacity outside the United States involve more than 500,000 bbl. daily. These projects include 10 new plants and enlargement of 12 others in both hemispheres. New plants alone account for 200,000 bbl. of the planned capacity increase outside of the United States. The remaining 300,000 of the 500,000 bbl. daily capacity not yet authorized is accounted for in planned expansion of existing plants also outside of the United States. Expansion of United

and Countries, Past, Present, and Projected

	1940			1948			1949 - 1950*		
	No. of refineries	Capacity, bbl. per day		No. of refineries	Capacity, bbl. per day		No. of refineries	Capacity, bbl. per day	
		Crude oil	Cracking		Crude oil	Cracking		Crude oil	Cracking
Poland	19	23,000	2,300	6	7,100		6	7,100	
Portugal	1	5,000	1,500	1	7,000		1	7,000	
Romania	23	219,200	49,200	16	178,500	50,000	16	178,500	50,000
Spain	1	1,500		1	700		1	700	
Sweden	1	3,500	2,700	3	26,300	2,900	3	27,800	2,900
Trieste	2	8,500		2	12,500		2	12,500	
Yugoslavia	3	4,800		5	8,300		5	8,300	
Total	147	685,300	199,700	120	682,990	165,770	126	933,620	172,170
Total E. Hemisphere	195	1,396,500	452,200	154	1,836,790	424,570	162	2,138,970	430,970
NORTH AMERICA:									
Canada	54	228,600	95,000	‡33	274,700	122,400	33	274,700	122,440
Cuba	1	4,200	2,100	5	6,100	1,200	5	6,100	1,200
Mexico	7	99,800	18,800	7	183,000	25,000	7	208,500	25,000
United States	459	4,524,800	2,276,200	‡386	6,001,900	3,781,700	392	6,400,000	3,900,000
Total	521	4,857,400	2,392,100	431	6,465,700	3,930,300	437	6,889,300	4,048,640
SOUTH AMERICA:									
Argentina	19	94,230	60,100	17	102,000	62,380	17	102,000	62,380
Bolivia	2	725		2	1,800		2	1,800	
Brazil	3	6,460		4	9,300		4	9,300	
Chile	3	535		2	350		2	350	
Colombia	2	14,500		2	23,200		2	23,200	
Ecuador	3	7,350		2	4,700		2	4,700	
Peru	3	22,000	6,800	3	32,800	6,600	3	32,800	6,600
Uruguay	1	5,000	2,000	1	9,000	2,000	1	15,700	2,000
Venezuela	9	76,325	22,800	11	119,100	24,000	13	219,100	24,000
West Indies:									
Aruba	2	305,000	260,200	2	417,000	203,000	2	417,000	203,000
Curacao	1	200,000	96,000	1	200,000	100,000	1	200,000	100,000
Trinidad	7	79,300	28,350	5	96,300	50,000	5	96,300	50,000
Total	55	811,425	476,250	52	1,015,550	447,980	54	1,122,250	437,980
Ttl. W. Hemisphere	576	5,668,825	2,868,350	483	7,481,250	4,378,280	491	8,011,550	4,436,620
Total world	771	7,065,325	3,320,550	637	9,318,040	4,802,850	653	10,150,520	4,927,590

*Includes projects under construction and authorized. †Plant located in Manchuria. ‡Mid-1948.

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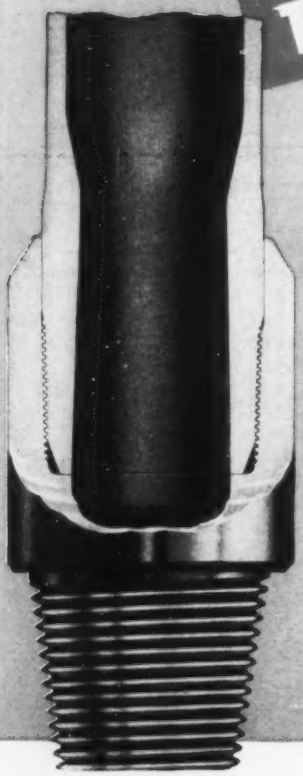
REED *Super Shrink-Grip* TOOL JOINTS

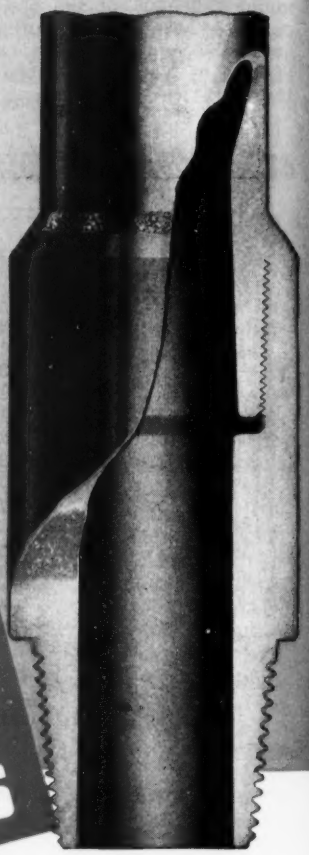


for easy replacement in the field

1. The "Shrink-Grip Safety Area" supports the drill pipe against bending and failure at last engaged thread. Seals against leakage.
2. The gauging shoulder assures proper make-up and seals against leakage.
3. Threads with a wide crest and root assure a dependable connection.
4. Accurate alignment between all tool joint and pipe threads reduces torsional stresses and the hazards of costly failures.

- Hand application at the rig reduces application and replacement cost.

REED *Counterbore-Weld* (PATENTED) TOOL JOINTS



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The Reed three-bead process of welding produces a strong, sturdy weld, as each bead is normalized when the next bead is applied. Deep penetration provides maximum holding capacity, and effective distribution of stresses is assured.

Reed's shop practice of welding with the drill pipe and tool joint held at a 45 degree angle, assures a better welding job than that usually obtained with the pipe held on a horizontal plane.

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CONVENTIONAL CORE DRILL

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The oil resistant core barrel bearing is replaceable at the rig and will help keep your core barrel out of the repair shop.

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Wire Line
CORING-DRILLING OUTFIT

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- The replaceable core cutter head assures maximum cutting action at all times, while coring.

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States capacity for 1948 will be published in The Oil and Gas Journal's fourth-quarter report on completed and active projects.

Before 1949 ends a number of additional projects are expected to be announced. The projects in this group are those now under consideration. Several new plants and expansion of a number of existing refineries are involved in the studies now being made. Probability of the majority of these under-consideration projects being approved is high. Capacity of those for which approval is assured, contingent on world conditions, is estimated upwards of an additional quarter-million barrels daily outside of the United States.

Trends in Design

In the consuming centers of Western Europe and in Great Britain, with exception of those refineries manufacturing specialty products, most plants are currently operating cracking units as crude-oil skimmers. A few companies report their cracking plants operating in normal service and others show their cracking facilities operating either at reduced capacity or not at all for the production of cracked gasoline. A similar situation exists in several of the other world refining areas.

Existing cracking equipment in the countries outside of the United States is generally the older-type thermal unit. Some newer equipment including catalytic processes are installed in refineries in the Middle East area. A 30,000-bbl.-daily unit is now being built in Iran. Currently, in the countries outside of the United States, thermal rather than catalytic cracking processes are being installed and considered in the majority of expansion programs. A number of thermal units for operation on heavier stocks are being installed in or planned for refineries in both Western Europe and South America. Several reforming units are being erected or will be built in these areas also.

Some expansion is reported for lube oil production capacity in a few of the refineries outside of the United States. The largest single project now under way is a new plant for one of the refineries in the Middle East. No appreciable expansion of lube-oil-production capacity is reported for any of the other countries outside of those in North America and the Middle East. Expansion of the refinery in Wales includes lube-oil equipment on which no figures were reported.

In the countries outside of the United States, Great Britain leads in expansion of petrochemical plants. The plants now building plus those planned will give Great Britain a sizable capacity for manufacture of petroleum-derived products. No information is available on the petrochemical plants which may be operating in Russia. Consequently Great Britain may or may not be second to the United States in this field. Reports show no expansion of petrochemical plants is currently under way or authorized for any countries other than United States and Great Britain.

Geographical Redistribution

Greatest gains in refining capacity since the war for those countries outside of the United States has been in the larger crude-oil-producing areas, the Middle East and South America. Next has been in the larger consumer countries adjacent to the large production areas. The smallest refining-capacity expansion of course is in the relatively high consumer countries which have little or no crude-oil production and are remote to large producing areas. Along with several other countries Australia falls within this latter group.

Completion of two refineries now under construction in Australia plus the expansion of another plant will provide this country with 15,200 bbl. capacity. The plants now building are scheduled for operation by mid-1949. The work under way will step up

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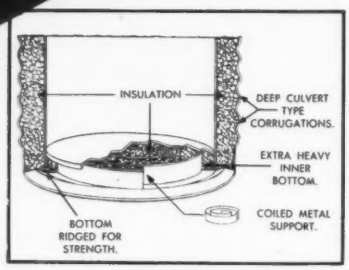

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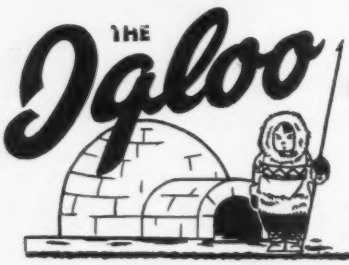

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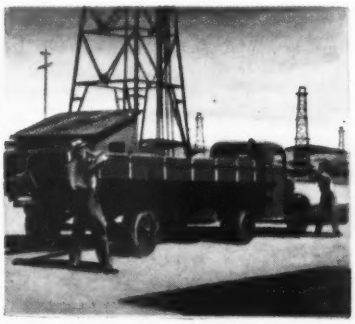

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★ Seismograph Service Corporation (United States and Foreign)
★ Seismograph Service Corporation of Delaware (South America)
★ Westby Geophysical Corporation (Mexico and Bahamas)
★ Seismograph Service Limited (Sterling Area)
★ Seismograph Service Corporation of Venezuela
★ Seismograph Service Corporation of Peru
★ American Exploration Company (U. S. A.) Marine

Seismograph Service Corporation

TULSA, OKLAHOMA, U. S. A.

from 3,000 to 7,000 bbl., the Commonwealth Oil Refineries, Ltd., plant at Laverton.

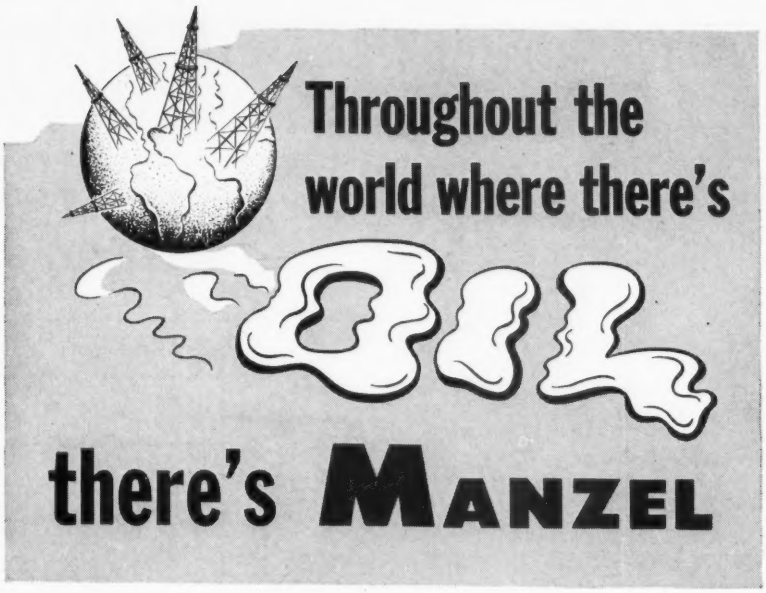
Rehabilitation and expansion operations on some of the plants in the East Indies are under way. Plans for rebuilding three of the smaller refineries which were destroyed during wartime so that they would have no productive value to the Japanese, have not been announced. Others of the destroyed plants were repaired and put in operation soon after Japanese forces had been driven out of the area. One of the larger plants is being expanded by approximately 30 per cent of its current capacity of 46,000 bbl.

Russian Increase Not Known

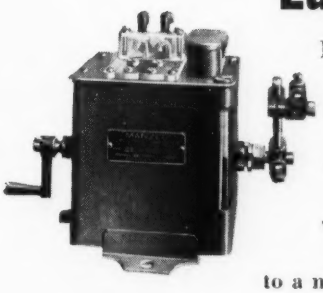
Just how much increase has been made in Russia's refining capacity cannot be determined since no official reports are available currently. In late 1940 Russia reported 14 refineries with a total crude-oil capacity of 637,500 bbl. daily. In all, prewar Russia is shown to have had 19 plants, 4 of which operated cracking units only. Six of the refineries reported in 1940 were topping plants whereas eight were equipped with both topping and cracking facilities. Information on refining operations is also not available officially from countries where industry is nationalized.

Direct reports on refining operations in China show the plant in Formosa has been expanded, only recently, from 8,500 to 16,850 bbl. daily. One of the other two plants in China outside of Russian-controlled Manchuria is reported to have been destroyed in late October 1948. Capacity of the two refineries on operational status is currently 17,850 bbl. Recent A.M.G. reports show seven refineries in Japan, all of which are suitable for operation. In fact all of these plants are shown to be operating except one, a 2,500-bbl. unit, which is designed for processing special-type crudes. Current refining capacity in Japan is slightly less than half of that reported for late wartime. According to postwar investigations, damage to Japan's refineries during the war reduced the total capacity to approximately 40,000 bbl. Since Japan's surrender most of the refining and coal-liquefaction plants have been converted to other services.

Outside of the United States, Canada, Russia, and Russian-controlled areas the net gain in refining capacity over 1940 is more than 915,000 bbl. on topping operations. This capacity figure may be boosted by approximately 750,000 bbl. within the next few years. New plants will account for 33 per cent of this additional capacity and expansion of existing refineries will make up the remainder.

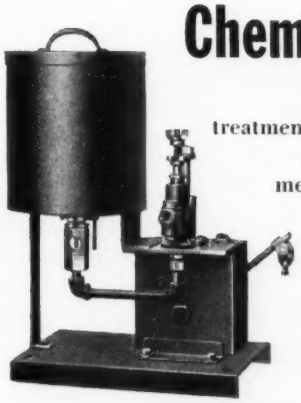


Lubricators



Manufacturers serving the world-wide petroleum industry standardize on Manzel Force Feed Lubricators to make sure users of their machinery will receive long, economical, trouble-free service. Manzels supply all wearing parts with just enough of the right lubricating oil...cut labor costs to a minimum...reduce oil consumption to half that of hand feeding...prevent costly breakdowns.

Chemical Feeders



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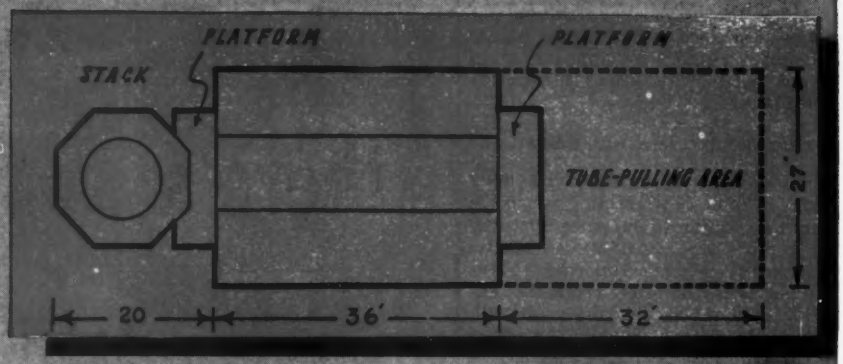
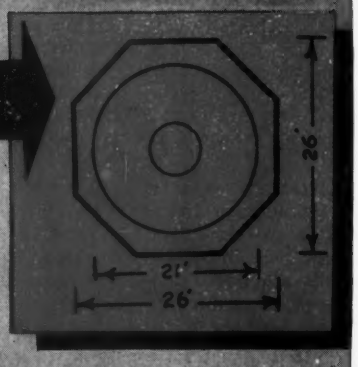
PETRO-CHEM ISO-FLOW FURNACES ARE PRE-EMINENT WHERE GROUND SPACE IS A FACTOR . . . . . *and it always is!*

Ground space plan for average box-type furnace of 50 million BTU/hr capacity



THE SAVING IN GROUND SPACE IS OBVIOUS!

Ground space plan for average Petro-Chem Iso-Flow Furnace of 50 million BTU/hr capacity



Did you ever try to cramp additional equipment into the confines of an existing refinery, or plan the layout of equipment for a new plant . . . if you did, you know the importance of every square foot of ground space.

Compare the ground space required for a box-type furnace (including the necessary space for tube-pulling, stack and platforms) with that of a Petro-Chem Iso-Flow Furnace of identical capacity. The net saving of space is considerable.

The vertical design of the Iso-Flow Furnace eliminates the need of ground space for platforms, stack and tube-pulling.

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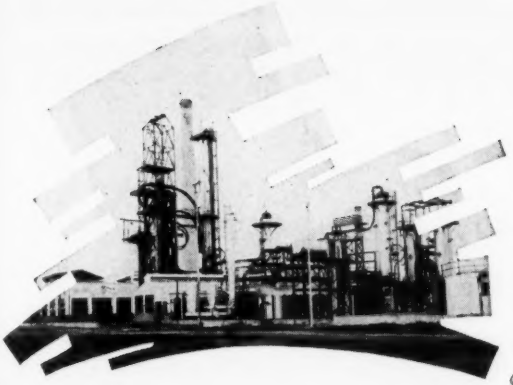


International

SURVEY of OIL REFINERIES

SUMMARY OF WORLD REFINING CAPACITY

	Number refineries	Crude capacity (bbl. dly.)	Cracking capacity* (bbl. dly.)
Argentina	17	102,000	62,330
Australia	4	15,200	None
Austria	8	18,970	4,000
Bahrein Island	1	150,000	24,600
Belgium	6	11,600	None
Bolivia	2	1,800	None
Brazil	4	9,300	None
Burma	2	4,000	.....
Canada	33	274,700	122,440
Canary Islands	1	10,000	5,000
Chile	2	350	None
China	2	17,850	.....
Colombia	2	23,200	None
Cuba	5	6,100	1,200
Denmark	3	620	None
East Indies:			
Borneo	4	14,000	2,000
Sarawak	1	35,000	None
Sumatra	4	166,600	38,700
Ecuador	2	4,700	None
Egypt	2	37,750	7,000
Eire	1	650	None
England	12	108,850	10,000
France	15	300,100	50,500
Germany	26	65,130	9,520
Hungary	8	23,100	350
India	1	5,750	1,500
Iran	2	502,100	125,000
Iraq	2	9,000	None
Italy	7	54,400	16,000
Japan	7	16,300	None
Mexico	7	208,500	25,000
Netherlands	2	27,000	21,900
Pakistan	1	4,800	2,000
Palestine	1	86,000	33,000
Peru	3	32,800	6,600
Poland	6	7,100	None
Portugal	1	7,000	None
Romania	16	178,500	50,000
Saudi Arabia	1	131,000	20,000
Scotland	3	19,300	3,000
Spain	1	700	None
Sweden	3	27,800	2,900
Trieste	2	12,500	None
Trinidad	5	96,300	50,000
United States‡	392	6,400,000	3,900,000
Uruguay	1	15,700	2,000
Venezuela	13	219,100	24,000
Wales	1	62,000	4,000
West Indies:			
Aruba	2	417,000	203,000
Curacao	1	200,000	100,000
Yugoslavia	5	8,300	None
Total world (excluding Russia)†‡	653	10,150,520	4,927,590

*Including both catalytic and thermal processes.

†Estimates on U.S.S.R. refining capacity show 25 plants having a total rating of 650,000 bbl. crude oil and 250,000 bbl. cracking daily.

‡Includes projects building and authorized. Additional data for U. S. and other countries appear in the Journal's Refining Number and Quarterly Refinery Construction Reports.

ARGENTINA

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
"Astra" Compania Argentina de Petroleo, S. A., Avenida Alem 621 (R.I.), Buenos Aires	Comodoro Rivadavia	*2,500	S	None
Cia. Ferrocarrilera de Petroleo, Paseo Colon 185, Buenos Aires	Comodoro Rivadavia	6,000	S-C-L	5,800
Cia. General Asfaltos, Buenos Aires	Wilde, Buenos Aires	500	S-L	None
Cia. Nativa de Petroleos, S. A., Av. Pte. R. Saenz, Pena 567, Buenos Aires	Campana	16,000	Comp.	9,100
	Puerto Galvan	5,000	S-A	2,200
Cia. La Isaura, S. A., Ave. Pte. R.S., Pena 699, Buenos Aires	Bahia Blanca	*2,200	S	None
Cia. Condor, Levalle 27, Avellaneda	Avellaneda, Buenos Aires	1,300	S-L	None

ARGENTINA (Continued)

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Diadema Argentina, S. A., de Petroleo, Av. 788 Roque Saenz Pena, Buenos Aires	Buenos Aires	12,000	S-C	9,000
Lottero-Papinia y Cia., Avellaneda	Avellaneda, Buenos Aires	300	S-L	None
Standard Oil Co., S. A., Argentina Av. R. Saenz Pena 567, Buenos Aires	Manuel Elordi	1,100	S	None
	Plaza Huincul	450	S	None
Ultramar, S. A., Petrolera Argentina, Av. Alem 619, Buenos Aires	Avellaneda	6,500	Comp.	2,800
Yacimiento Petroliferos Fiscales, Avda. Roque Saenz, Pena 777, Buenos Aires	La Plata	†30,000	Comp.	23,000
	San Lorenzo	9,500	S-C	6,200
	Plaza Huincul	1,550	S-C	570
	Mendoza	5,000	S-C	2,760
	Chachapoyas	2,100	S-C	950
Total Argentina		102,000		62,380

*Reported shut down. †Capacity increase, to 50,000 bbl. daily, planned.

AUSTRALIA

Bitumen Oil & Refining Co. (Caltex Pty., Ltd., subsidiary), 115 Pitt St., Sydney	Sydney	*1,000	S-A	None
Commonwealth Oil Refineries, Ltd., 90 William St., Melbourne, C. 1, Victoria	Laverton, Victoria	†7,000	S	None
Shell Co. of Australia, Ltd., Shell Corner, 163 William St., Melbourne, C. 1, Victoria	Clyde, N.S.W.	‡6,000	S-A	None
Vacuum Oil Pty., Ltd. (Standard-Vacuum subsidiary), 29 Market St., Melbourne	Altona	§1,200	S	None
Total Australia		15,200		None

*Under construction. †Expanded capacity; current capacity approximately 3,000 bbl. daily. ‡Includes 1,000 bbl. per day topped crude capacity. §Under construction—completion scheduled for April 1949.

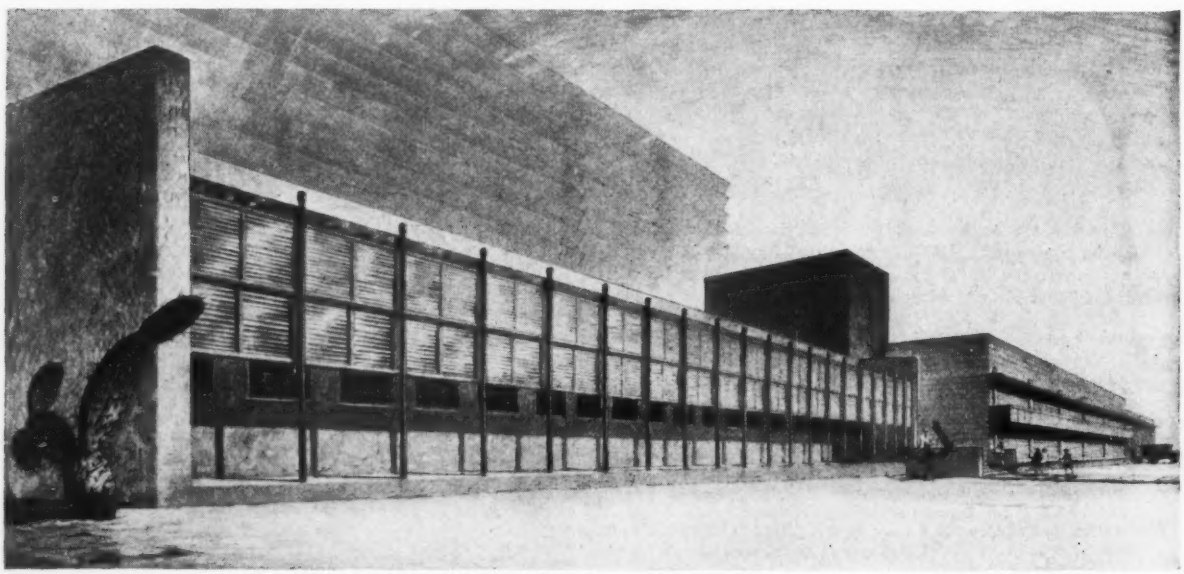
AUSTRIA

A. G. Der Shell-Floridsdorfer Mineraleol-Fabrik, Schubertring 14, Vienna 1	Floridsdorf	2,500	S-L-A-W	None
Creditul Minier Oesterreichlische-Rumanische, Petroleum-Vertriebs-Ges., Bulevardul Bratianu 16, Bucharest, Romania	Droesing	1,000	S	None
	Korneuburg	2,400	S	None
Donau-Oel-Tank-Lager, G.M.B.H., Vienna	Moosbierbaun	2,250	S	None
Elwerath-Wintershall I.G. Farbenindustrie (Socony-Vacuum and Shell), Vienna	Lobau	4,800	S	None
Nova Oel—und Brennstoff A. G., Vienna	Schwechat	3,000	S-C	4,000
Oesterreichische Fante, A. G., Kerrengasse, 17, Vienna	Lanzendorf	1,120	S	None
Vacuum Oil Co., A. G., Schwarzenbergplatz, 18, Vienna	Kagren	1,900	S	None
Total Austria		18,970		4,000

BAHREIN ISLAND

Bahrein Petroleum Co., Ltd., 551 Fifth Ave., N. Y. 17	Persian Gulf	*150,000	S-C-A	†24,600

*Crude-oil capacity currently rated at 145,000 bbl. daily. †Cracking facilities include two U.O.P. thermal units with total capacity 13,600 bbl. daily and one U.O.P. fluid catalytic unit 11,000 bbl. daily. The catalytic unit is now shut down.



Artist's sketch of new research and development laboratory of Bahrein Petroleum Co., Ltd., to be erected on Bahrein Island

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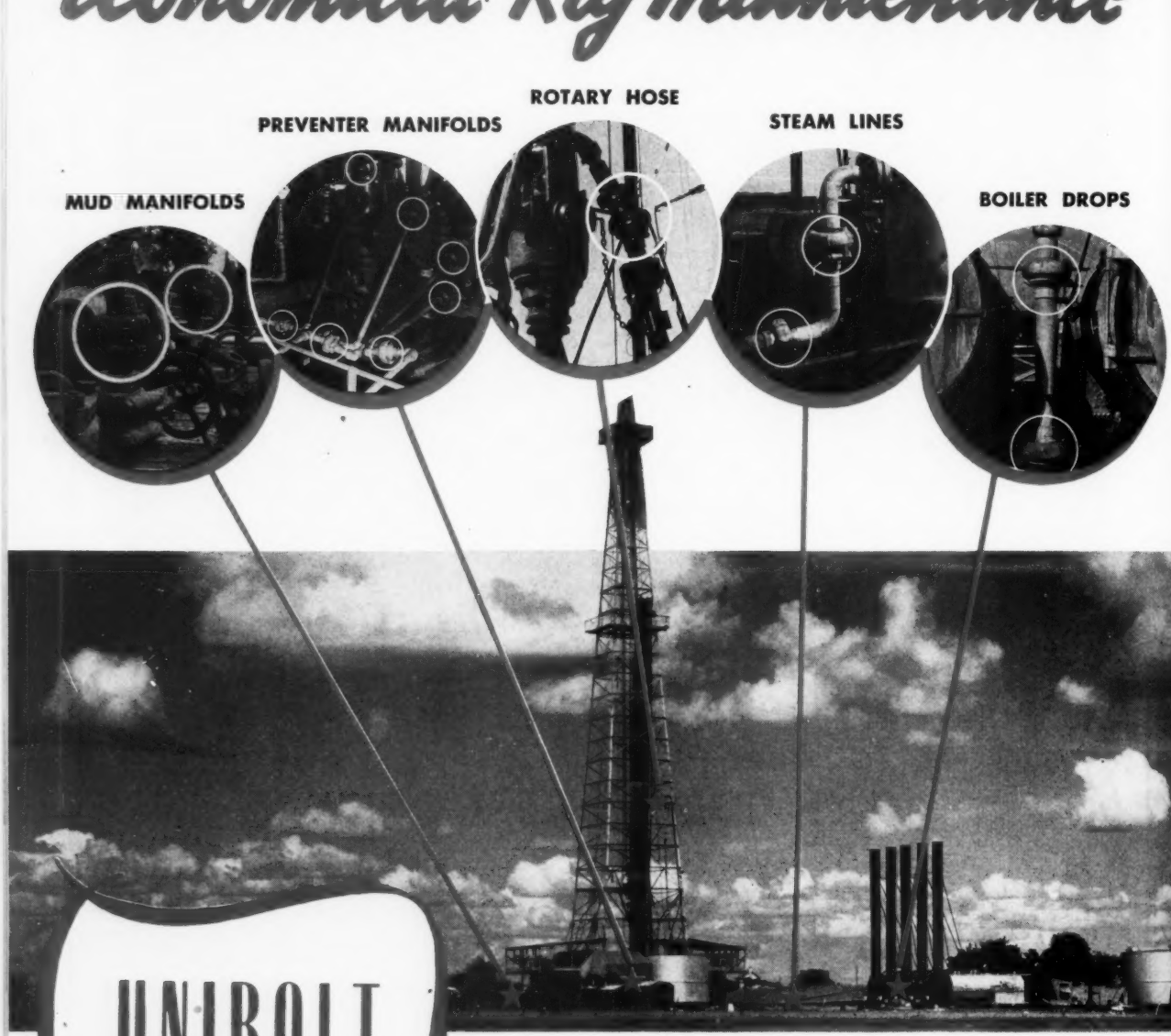
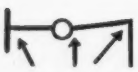
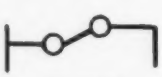


UNIBOLT *Flexi-Ball* JOINTS



STRESS HERE

Using only one Ball Joint does not properly eliminate stress resulting from contraction or expansion.



NO STRESS

Using two Ball Joints in series eliminates stress resulting from contraction or expansion.

The Flexi-Ball Joint, which provides for misalignment up to 38 degrees, depending on the size of the joint, is designed to relieve lines of stress resulting from expansion, vibration, or misalignment. It is a "natural" for flexible manifolds.

The proven UNIBOLT coupling principle is employed to join the component parts of this fitting. As a result, trouble due to galling and freezing of threads is entirely eliminated by the Flexi-Ball design. It is assembled by the simple process of tightening one bolt with an end wrench. Even after extended periods of service, the joint can be quickly dismantled by releasing the bolt.

This fitting may be used safely in any service, since it is made in steel only. Its sizes range from 1½" to 6" and test pressures to 6000 lbs., depending on size; 500 lbs. steam working pressure.

THORNHILL-CRAVER COMPANY

HOUSTON, TEXAS

BELGIUM

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Belgian Shell Co., 47 Canterstun, Brussels	Ghent	*2,300	S-L-A	None
Cie. Industrielle Atlas S. A. Belge, 101 Avenue de France, Antwerp	Hoboken-Antwerp	†2,000	S	None
Raffinerie Belge de Petroles, 116 Avenue de France, Antwerp	Antwerp	‡3,800	S	None
Raffinerie et Distilleries Anversoises, Antwerp	Antwerp	§2,000	S	None
Redeventza S. A. Belge Pour le Raffinage de Petrole, 10 Petroleumkaai, Anvers-Kiel	Antwerp-Kiel	§300	S	None
Tankage et Transport, S. A., 10 Palace Leopold, Antwerp	Antwerp	¶1,200	S	None
Total Belgium		11,600		None

*Topped crude. †Constructing 85,000-cu.-ft.-per-day L.P.G. plant. ‡This plant, as are several other Belgium refineries, is engaged in repairing war-damaged facilities. Expansion planned by Raffinerie Belge de Petroles include a 2,000 bbl. daily topping-distillation unit. Vacuum-distillation unit, reforming plant, and tanks and auxiliary equipment. §Shut down. ¶Plans are being considered for increasing capacity to 3,000 bbl. per day on crude oil and addition of reforming unit. Refinery not operating according to current reports.

BOLIVIA

Yacimientos Petroliferos Fiscales Bolivianos,* Avs. Gral. Camacho y Bueno	Camiri	1,400	S	None
	Sanandita	400	S	None
Total Bolivia		1,800		None

*Yacimientos Petroliferos Fiscales Bolivianos reports plans for construction of two other refineries. One will be a topping-reforming plant of about 5,000 bbl. daily capacity at Cochabamba which will produce aviation gasoline along with other products; the other at Sucre will be a skimming plant with a capacity of 1,000 bbl. daily. Both plants will be designed to permit capacity increase.

BRAZIL

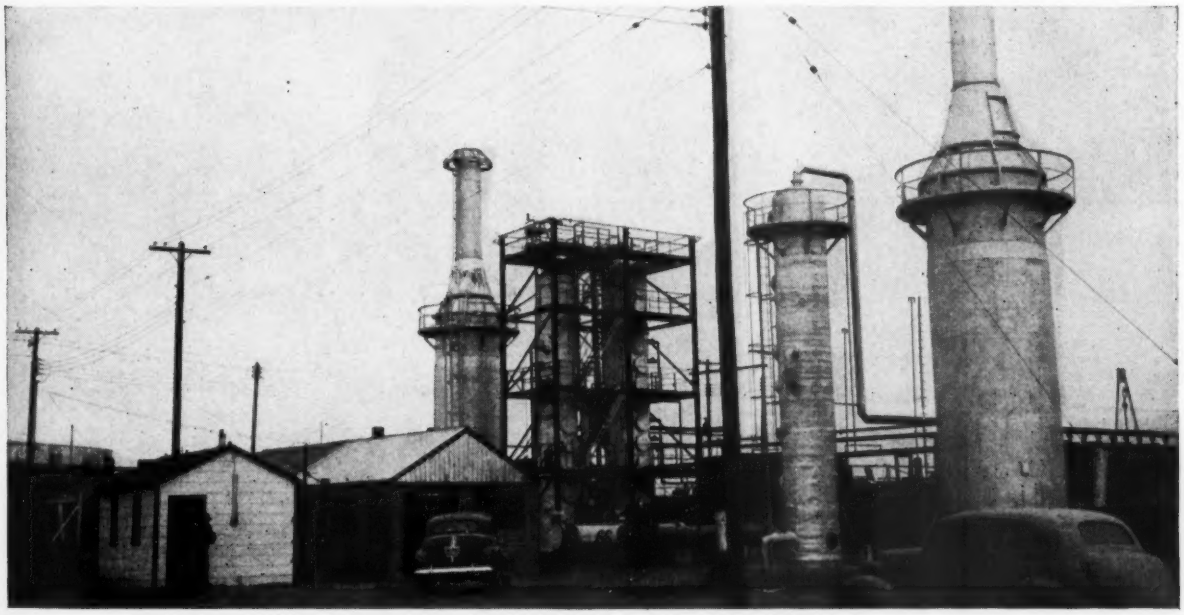
Conselho Nacional de Petroleo, Av. Presidente Wilson, 164, Rio de Janeiro	Salvador, Bahia	2,500	S	None
Industrias Matarazzo de Energia, S. A. "IME" Precio	Sao Paulo	800	S	None
Conde Matarazzo, Sao Paulo	Sao Caetano	3,500	S	None
Ipiranga S. A. Cia. Brasileira de Petroleas, Saco de Mangueira sem numbro, Rio Grande	Rio Grande	*2,500	S	None
Total Brazil		9,300		None

*Current operations approximately 900 bbl. daily.

Note—A new refinery, to handle total 2,500 bbl. daily of indigenous crude, is to be constructed in the State of Bahia. A Brazilian company, Refineria de Petroleos de Distrito Federal, S. A., is also reported to be planning the construction of a 10,000-bbl. refinery near Rio de Janeiro which would handle Saudi Arabian or Venezuelan crude.

BURMA

The three refineries operated prewar in Burma were destroyed to prevent them from falling into hands of the Japanese. These refineries were all located near Rangoon. Principal one was the Syrian plant of 20,000-bbl. crude capacity and 3,000-bbl. cracking capacity. Burmah Oil Co., Ltd., is reported now constructing its Syrian refinery. Seikky, another prewar Burma plant, is scheduled for reconstruction by Indo Burmah Petroleum Co., Ltd. Capacity of this refinery is reported at 3,000 bbl. per day. Thilawa, the third refinery, prior to its destruction was rated at 2,500 bbl. per day crude-oil capacity. Two refineries are reported to be now operating in Burma. Capacity of these plants is approximately 2,000 bbl. per day each.



New construction at refinery of Husky Oil & Refining, Ltd., at Lloydminster, Alta., Canada

INTERNATIONAL REFINERY SURVEY

CANADA

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
A detailed listing of operating refineries in Canada was published on page 231 of The Oil and Gas Journal's annual Refining Number, April 1, 1948. Exclusive of small topping plants, the total capacity for Canada:		268,900		121,440

Note—The 1949 survey is scheduled to be published March 24, 1949.

CANARY ISLANDS (Spain)

Cia. Espanola de Petroleos, S. A., Alcala, 31, Madrid	Sta. Cruz de Tenerife	*10,000	S-C-A†	5,000

*Plans are under way for increasing crude-oil capacity to 17,000 bbl. per day. †Installing atmospheric and vacuum unit and facilities for refining lube oils and waxes.

Note—A new 20,000-bbl.-per-day refinery is being planned for Cartagena. This proposed refinery is reported to be a joint project of California-Texas Oil Co., Ltd., Cie. Espanola de Petroleos, S. A., and Institute Nacional de Industria.

CHILE

Total capacity of the two small refineries operating in Chile is reported at 350 bbl. per day total. These refineries operate only as skimming plants. Corp. de Fomento is reported planning a 10,000-bbl.-per-day refinery for erection at Santiago.

CHINA

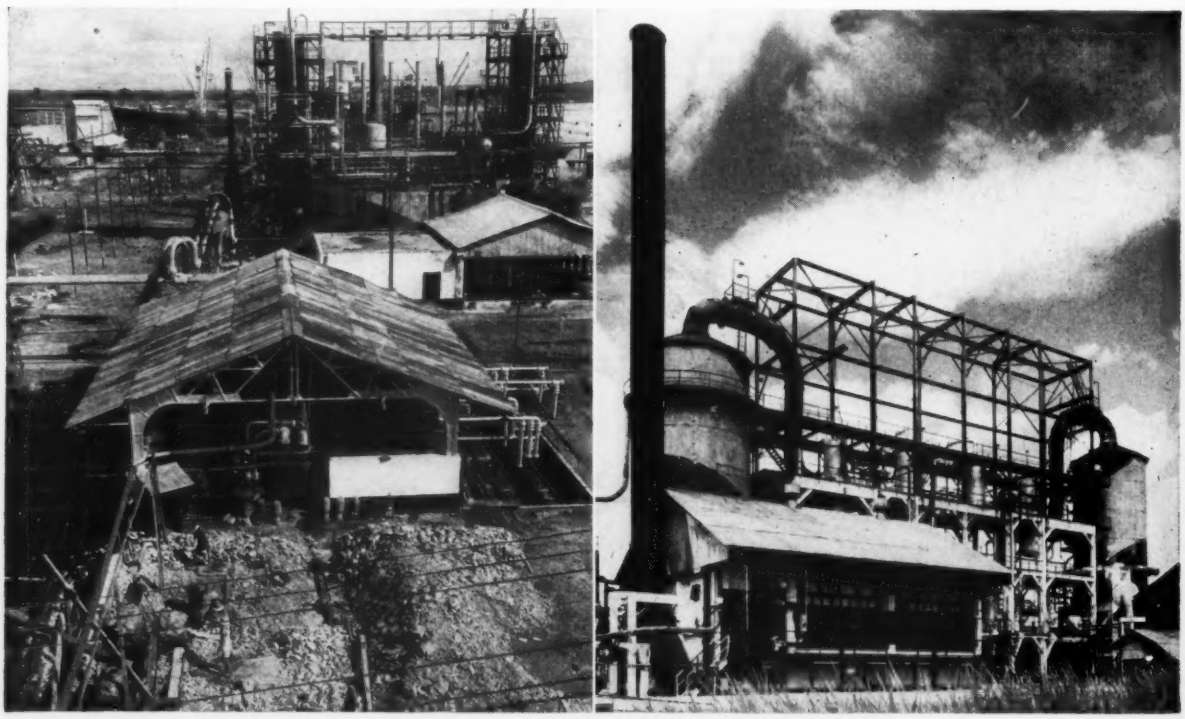
Chinese Petroleum Corp.	Kaoshiung, Tiawan, Formosa	*16,850	S-C-A	
	Yumen, Kansu Province, China	†1,000	S-C	
Total China		17,850		

*Capacity currently is rated at 8,500 bbl. daily. The 8,350-bbl.-per-day crude-oil topping unit and thermal cracker now building at the Kaoshiung refinery are scheduled to be placed in operation early in 1949. This refinery is also equipped with a 1,000-bbl.-daily asphalt unit which is not operating. †Information on the cracking capacity of the Yumen refinery is not available. Facilities at the refinery consist principally of a combination cracking-topping unit.

Note—A third refinery in China, known as the Northwest Refinery, located in territory reported to be held by groups hostile to the current Chinese Government, is reported as currently destroyed.

COLOMBIA

Colombian Petroleum Co., Cucuta, Colombia	Petrolea	700	S	None
Tropical Oil Co., Apt. 170, Via Cartagena, El Centro	Barranca-Bermeja	22,500	S-L-A	None
Total Colombia		23,200		None



Left: Clearing war rubble from rehabilitated pump house at Standard Vacuum Petroleum Maatschappij's Soengei Gerong refinery near Palembang, South Sumatra. Right: War-damaged stills are now rehabilitated after Allied air raids and negligence during Jap occupation. Refinery output has surpassed prewar

CUBA

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Cia. Cubana de Petroleo, S. A., Havana	Havana	500	S	None
Standard Oil Co. of Cuba, Havana	Belot	4,500	S-C-L-A	1,200
Destiladora Jarahueca	Santa Clara	200	S	None
Cia. Petrolera Jarahueca	Jarahueca	600	S	None
Union Gas Co.	Bacuranao	300	S	None
Total Cuba		6,100		1,200

DENMARK

Dansk Mineraloliefabrik	Copenhagen	50	L	None
Kalundborg Olieraffinaderi, Ostre Hauneveg, Kalundborg	Kalundborg	500	S-A	None
L. C. Glad Co., A. S.	Copenhagen	70	L	None
Total Denmark		620		None

EAST INDIES

Borneo

De Bataafsche Petroleum Mij., Carl van Byjlandtlaan 30, The Hague	Balik Papan	9,000	S	None
	Tjepoe	*3,000	S-C	2,000
	Wonokromo	1,500	S	None
Standard-Vacuum Petroleum Mij., Soengei Gerong, Sumatra	Kappean	*500	S	None
Total Borneo		14,000		2,000

*Shut down.

Sarawak

Sarawak Oilfields, Ltd., Miri, Sarawak	Lutong	35,000	S	None

Sumatra

De Bataafsche Petroleum Mij., Carl van Byjlandtlaan 30, The Hague	Pangkalan Brandan	*19,300	S	None
	Pladjoe	45,000	S	7,700
Standard-Vacuum Petroleum Mij., Soengei Gerong, Sumatra	Soengei	†64,000	S-C-W	31,000
	Gerong	38,300	S	.....
Total Sumatra		166,000		38,700

*Shut down. †Expansion program now under way. Current capacities 46,000 bbl. per day crude oil and 31,000 bbl. per day cracking.

ECUADOR

Anglo-Ecuadorian Oilfields, Ltd., Ancon, Santa Elena	La Libertad	4,000	S-L	None
Ecuador Oilfields, Ltd., Apt. 865, Guayaquil	Cuativo	700	S	None
Total Ecuador		4,700		None

View of International Petroleum Co., Ltd.'s, refinery at Talara, Peru

EGYPT

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Anglo-Egyptian Oilfields, Ltd., Great Street, St. Helens Court, London, E.C. 3, England	Suez	*36,000	S-C-A	7,000
Raffinerie de Petrole du Government, 18 Rue Fouad Ier, Alexandria	Suez	†1,750	S	None
Total Egypt		37,750		7,000

*Refinery to be modernized. †Plans call for crude-oil capacity to be increased to 3,500 bbl. per day.

ERIE

Cork Harbour Oil Wharves, Ltd., Haulbowline Island, Co. Cork	Haulbowline Is.	650	S	None

ENGLAND

Anglo-American Oil Co., Ltd., 36 Queen Anne's Gate, Westminster*	Fawley	†18,000	S-C-A	7,000
Berry, Wiggins & Co., Ltd., 86 Strand, London, W.C. 2, England	Kingsnorth Kent	2,500	S-L	None
	Weaste North Manchester	1,500	S	None
Cory Brothers & Co., Ltd., 57/59 St., Mary Axe, London, E.C. 3	Coryton, Essex	4,000	S-C-A	‡2,000
Lobites Oilfields, Ltd., 146 Dashwood House, Old Bread Street, London, E.C. 2	Ellsmere Port	4,000	Comp.	1,000
London & Coastal Oil Wharves, Ltd., 3 St. Helen's Place, London, E.C. 2	Canvey Island	1,500	S	None
London & Thames Haven Oil Wharves, Ltd., 3 St. Helen's Place, London, E.C. 2	Thames Haven	10,000	S-L	None
Major & Co., Ltd., London	Hull	1,250	S-L	None
Manchester Oil Refinery, Ltd., Twining Road, Trafford Park, Manchester, 17, England	Trafford Park§	2,800	S-L-W	None
Shell Refining & Marketing Co., Ltd.,¶ Norman House, Strand, London, W. 1	Shell Haven	‖16,600	L-A	None
	Stanlow	‖16,700	L-A	None
	Tremple, Heysham£	30,000		
Total England		108,850		10,000

*Formerly AGWI Petroleum Corp., Ltd. †Expansion to 120,000 bbl. per day planned. ‡Not operating. §Expansion of plant for the production of petroleum-derived surface-active agents completed. Expansion of blending and filling department and additional administrative buildings planned. ¶The Shell organization has begun construction of a petrochemical plant on an 85-acre site at Thornton-le-Moors; plant to have capacity of 24,000 tons a year of various products of petroleum origin. Existing plants associated with this new equipment are the Shell Haven and Stanlow refineries. The Stanlow plant is producing some 24,000 tons a year of chemical products; expansion to 50,000 tons a year planned. Expansion at Shell Haven will increase the petrochemical capacity to about 30,000 tons a year. ‖Topped crude and various distillates capacity. £Formerly government-owned refinery.

Note—Anglo-Iranian and Gulf Oil Corp. plan to construct 90,000-bbl.-per-day refinery at Isle of Grain, Kent.

FRANCE

Cie. de Raffinage "Shell-Berre," 29 Rue de Berri, Paris 8	Berre, Buches du Rhone	22,000	S-L-W	None
	Petit-Couronne, Seine Inferieure	34,000	Comp.	*4,500
	Pauillac, Gironde	4,500	S-A	†None
Cie. Francaise de Raffinage, 11 Rue du Doctor Lanceraux, Paris 8	Gonfreville-l-Orcher, Seine Inferieure	‡50,000	S-W-A	19,900
	A la Mede, Bouches du Rhone	‡50,000	S-A	17,100
Cie. Industrielle des Petroles, 54 Rue de Londres, Paris 9	Frontigan, Herault	§9,000	S-L-W	None
Les Propetrol Consommateurs de Petrole¶	Brest	10,300	S	None
Raffineries de la Vacuum Oil Co., S.A.F., 46 Rue de Courcelles, Paris	Notre Dame de Gravenchon, Seine Inferieure	15,000	S	‖None
Raffineries Francaises des Petroles de Atlantique, Donges, St. Nazaire	Donges	£12,000	S-L	None
Raffineries de Petrole de la Gironde, 7 Place Vendome, Paris	Ambes, Gironde	**13,800	S-C	5,000
Pechelbronn S.A., d'Explorations Minieres, 32 Allee de la Robert Sau, Strasburg	Merkwiller-Pechelbronn	1,500	S	None
Standard Francaise des Petroles, 82 Champs Elysees, Paris 8	Notre Dame de Gravenchon, Seine Inferieure	30,000	S-L-A	(††)
Ste. Generale des Huiles de Petrole, 19/21 Rue de la Bienfaisance, Paris 8	Courchelettes, Nord	(††)		
	Dunkerque, Nord	§§26,000		
	L'Avera, Bouches du Rhone	22,000	S-C	4,000
Total France		300,100		50,500

*4,000 bbl. per day employed temporarily in topping service. †Cracking facilities destroyed during war time. ‡Includes 20,000 bbl. per day topping capacity now under construction. §Current capacity of 2,000 bbl. per day to be increased to 9,000 bbl. per day by mid-1949. ¶Combined with Brest Port Petrolier. ‖Plans for future operations include naphtha reforming, vis-breaking and gas-oil cracking. £Current capacity of 3,500 bbl. per day to be increased to 12,000 bbl. per day in 1949. **War damaged facilities being reconstructed; completion scheduled for 1949. Additional facilities include 3,200 bbl per day reformer and if and when needed a thermal cracker. ††Rebuilding war damaged cracking plant. ‡‡Refinery, 50 per cent destroyed by war, is to be reconstructed at Dunkirk in which new location the plant will have a capacity of 26,000 bbl. per day of crude oil. Remaining facilities at the refinery (Courchelettes) are to be rehabilitated for processing stocks from Dunkirk into lubes. §§Destroyed in wartime but will be rebuilt to replace the present Courchelettes refinery—see reference (‡‡).

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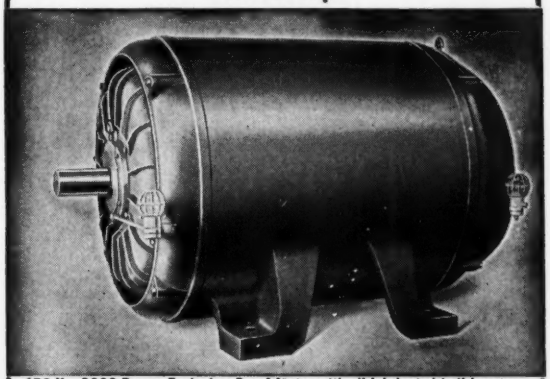

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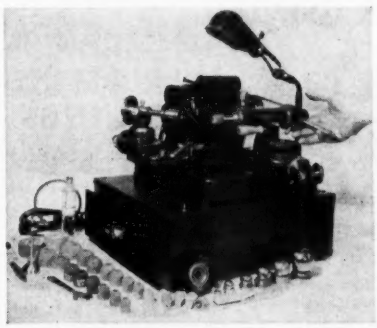

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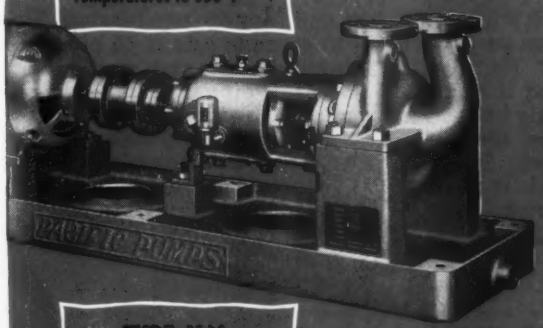

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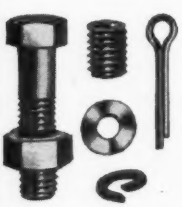

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HARPER

GERMANY

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
American Zone of Occupation				
Zeller and Gmelin, Eislingen, Wuerttenberg	Eislingen	150	S-L	None
British Zone of Occupation				
Deutsche Erdoel, A.G., Wietze, Kries Celle, Niedersachsen	Heide-Holstein	2,800	S	None
	Wilhelmsburg	•2,300	S-L-W	None
	Wietze, Kreis Celle	950	S-L-A	None
Deutsche Gasolin, A.G., Hannover, Jordanstr. 32	Dollbergen-Lehrte, Hannover	2,000	S-L-A	None
Deutsche Shell, A.G., Shell Haus, Hamburg 36, Alster Ufer 45	Harburg	•8,400	S-L-A	None
	Manheim	1,700	S	None
	Grasbrook	†1,300	L	None
	Reisholz	†930	....	None
	Wilhelmsburg	†560	....	None
Deutsche Vacuum Oel, A.G., Hamburg-Niendorf, Lokstedter Holt	Bremen-Oslebshausen	†3,700	S-L-W	None
	Wedel	†700	L-W	None
Ebano Asphalt-Werke, A.G., Hamburg 36, Neuer Jungfernstieg	Harburg	§17,000	S-L-A	None
Ernst Schliemann's Oelwerke, Hamburg 1, Spitalerstr	Grasbrook	†470	L	None
Europaeische Tanklager & Transport, A.G., Hamburg 1, Ferdinandstrasse 29/31	Hamburg-Finkenwaerder	¶5,800	S-C	£5,800
Gewerkschaft DEURAG-NERAG, Hannover, Hindenburgstr, 27/29	Misburg n. Hannover	7,500	Comp.	3,300
Johann Haltermann, Hamburg 1, Ferdinandstr, 55/57	Wilhelmsburg	‖1,200	S	None
Mineraloelwerke Albert Sengewald, Dedenhausen, Hannover	Dedenhausen, Hannover	£470	S	None
Mineraloel and Asphaltwerke, A.G., Hamburg 1, Ferdinandstr, 29/31	Ostermoor-Holstein	••2,400	....	None
Mineraloelwerke Albrecht and Co., Hamburg 1, Glokengiesserwall 2	Grasbrook	†230	L	None
Mineraloelwerke Ernst Jung, Hamburg 1, Alsterdamm 16-18	Wilhelmsburg	†120	L	None
Mineraloelwerke Peine, Peine, Hannover	Peine, Hannover	350	S-L	None
Oelwerke Julius Schindler, G.m.b.H., Hamburg 36, Hohe Bleichen 28	Wilhelmsburg	‡700	S-L	None
Wintershall, A.G., Celle, Stoerckenstrasse	Salzbergen	1,200	Comp.	420
French Zone of Occupation				
Badische Anilin and Soda-Fabrik, Ludwigshafen	Ludwigshafen	(‡‡)	....	None
Russian Zone of Occupation				
Mineraloelwerke Luetzkendorf, Vereiningung Volkseigener Betriebe (Z) Kohlenwertstoffe, Luetzkendorf near Merseburg, Saxonia	Luetzkendorf	2,200	S-L-W-A	None
Total Germany		65,130		9,520

•War damaged—rebuilding. †Semifinished products processed. ‡1,400 bbl. per day capacity under construction. §Current capacity 10,000 bbl. per day. Additional 1,700 bbl. per day building. ¶Current capacity 3,500 bbl. per day. Additional 2,300 bbl. per day building. ‖Gasoline rerun operation. £Not operating. ••Original 1,200-bbl.-per-day refinery not operating. Reconstruction of war-damaged plant will provide 2,400 bbl. per day capacity. ††Charge composed of 400 bbl. per day of semifinished stocks and 300 bbl. per day of crude oil. ‡‡Plant operates to treat crude oil from Badish oil fields.

Note—Deutsche Shell, A.G., is reported to have arranged to process residuum stocks in the Wesseling hydrogenation plant; the agreement is with Union Rheinische Braunkohlen Kraftstoff, A.G. Deutsche Vacuum and Deutsche-Amerikanische Petroleum Gesellschaff are also reported to have entered into a similar agreement with Gelsenberg Benzin A.G., Gelsenkirchen.

HUNGARY

Fanto Associated Hungarian Oil Co., Ltd., Budapest 5	Budapest	1,100	S-L	None
Hazai Koolajipar R. T., Budapest	Budapest	1,100	S-L	None
Magyar Hydrobenzin R. T. D., Nador-Utca, Budapest	Petfurdo	1,200	S-C	350
Magyar Olaj Nuvek, Budapest	Szony	7,500	S	None
Magyar Petroleum-Dr. Freund, Budapest	Budapest (Csepel)	4,000	S	None
Nyirbogdanyl Petroleumgyar R. T., Budapest	Nyirbogdany	300	S-L	None
Shell Koolaj R. T., Josef Nador ter 5-6, Budapest	Budapest (Csepel)	3,500	S-L-A-W	None
Vacuum Oil Co., R. T. V., Budapest	Fuzito	4,500	Comp.	None
Total Hungary		•23,100		350

•Information on current operational status of various small refineries not available.

INDIA

Assam Oil Co., Ltd. (controlled and managed by Burmah Oil Co.), Digboi P.O., Lakhimpur Dist. Assam	Digboi	5,750	Comp.	1,500

IRAN•

Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, London, E.C. 2	Abadan†	500,000	S-C-A	125,000
Kermanshah Petroleum Co. (Anglo-Iranian), Britannic House, Finsbury Circus, London, E.C. 2	Kermanshah	2,000	S	None
Total Iran		502,000		125,000

•Does not include topping plants located in fields to supply field demands. †Catalytic cracking facilities (30,000 bbl. per day) and 500 bbl. per day lubricating oil plant under construction.

IRAQ

Iraq Petroleum Co., Ltd., City Gate House, Finsburg Circus, London, E.C. 2	Baba Gurgur•	1,500	S	None
Khanaqin Oil Co., Ltd. (Anglo-Iranian), Britannic House, Finsbury Circus, London, E.C. 2	Alwand	7,500	S	None
Total Iraq		9,000		None

•Iraq Petroleum Co., Ltd., also operates, in Kirkuk field, a 270,000-bbl.-per-day crude stabilization plant for removal of H_2S.

ITALY

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Azienda Nazionale Idrogenazione Combustibili, Milano Via Albania, 20	Bari	15,000	S-C-A	*8,000
	Livorno	5,000	S-C-A	2,000
Distillazione Italiana Combustibili, Soc. An., Venice	Porto Maghera (Venice)	5,600	S-C	3,500
Industria Raffinazione Oli Minerali, Rome via del Tritone 181	Venice†	12,000	S-C	1,000
Raffineria de Napoli S.P.A. (Socony-Vacuum), Casella Postale 269, Naples	Naples	‡9,000	S	None
Soc. per l'Industria Italiana del Petrolio (subsidiary "Nafta" Soc. Italiana del Petrolio ed Affini) Plaza della Vittoria, Genoa	Spezia	§7,500	S-C-A	1,500
Soc. Petrolifera Italiana Fornovo Taro	Fornovo Taro	300	S	None
Total Italy		54,400		16,000

*Includes 6,000 bbl. per day naphtha reforming which capacity is to be increased during 1949. A.N.I.C. and Esso Standard Oil Co. plan to reconstruct the Livorno refinery to increase its crude charging capacity to approximately 30,000 bbl. daily. †Building atmospheric-vacuum unit and 2,500-bbl.-per-day reformer. ‡Rebuilding reforming and cracking unit and constructing 10,000-bbl.-per-day crude unit which provides a potential of 19,000 bbl. per day of crude-oil capacity. §Includes 1,000 bbl. per day topped crude capacity.

JAPAN

Tao Nenryo	Shimizu	*2,500	S-L	None
Nippon Oil Co., Ltd.	Akita	4,000	S	None
	Niigata	2,550	....	
	Kashiwazaki	2,750	S-L	None
Nippon Kohyo	Funkawa	3,000	S-L	None
Showa Oil Co.	Hirasawa	750	S-L	None
	Niigata	750	....	
Total Japan		16,300		None

*Recent reports indicate this refinery not operating. Facilities are reported as suitable for operation on special crude oils.

Note—During the war, according to a report of the Allied Military Government, Japan's refineries had a total capacity of 110,145 bbl. daily. War damage reduced this capacity to approximately 40,000 bbl. daily. Facilities in some of the 16 refineries existing after the war are either converted or scheduled for other manufacturing processes. The seven refineries listed are on operational status as indicated for processing petroleum according to current official reports.

MEXICO

Petroleos Mexicanos, Av. Juarez 94, Mexico, D.F.	Arbol Grande	22,000	Comp.	None
	Ciudad Madero	66,000	S-W-A	6,400
	Atzcapotzalco	52,000	S-C	13,000
	Minatitlan	26,000	S-L	None
	Poza Rica	6,000	S	None
	Mata Redonda	11,000	S-C	5,600
	Salamanca	†25,500	S	None
Total Mexico		208,500		25,000

*Capacity scheduled for increase to 15,000 bbl. per day. †Building.

NETHERLANDS

Caltex Petroleum Maatschappij, The Hague	Pernis	*20,000	S-C	6,400
N. V. de Bataafsche Petroleum Mij. (Shell), Carl van Bijlantlaan 30, The Hague	Rotterdab (Pernis)	†7,000	Comp.	‡15,500
Total Netherlands		27,000		21,900

*Building, completion scheduled for early 1950. †Considering increasing crude-oil capacity to 70,000 bbl. daily. ‡Currently operating to process 16,000 bbl. crude oil daily.

PALESTINE

Consolidated Refineries (Anglo-Iranian), Ltd., Britannic House, Finsbury Circus, London, E.C. 2	Haifa	*86,000	S-C-A†	33,000

*Current capacity 83,000 bbl. per day; additional 3,000-bbl.-per-day capacity under construction. †Plan to construct 2,500-bbl.-per-day lube plant.

PAKISTAN

Attock Oil Co., Ltd., 24-28 Lombard St., London, E.C. 3	Rawalpindi	4,800	Comp.	2,000

PERU*

Cia. de Petroleo Ganso Azul, Ltd., Edificio San Martin, Lima	Agua Caliente Concession Rio Pachitea	800	S	None
Establecimiento Industrial de Zorritos (Peruvian Government), Apartado 130, Calle Constitution 25, Callao	Zorritos	1,000	S	None
International Petroleum Co., Ltd., Talara	Talara	31,000	....	6,600
Total Peru		32,800		6,600

*Emprese Petrolera Fiscal, a company operated by the Peruvian Government, is planning to construct at 6,000 to 9,000-bbl.-per day refinery at the Port of Callao.

POLAND

Nationalization of Polish industry decreed by the Polish Parliament places operation of refineries, along with other industries, in the hands of government officials for the account of the state. Poland's refining industry was rated at 23,000 bbl. per day before the war. Little information is available on present operations. The following list of plants is compiled from available sources:

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B103

POLAND (Continued)

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
(Formerly Vacuum Oil Co.)	Czechowice	1,250	S-A-W-L	None
(Formerly owned by the "Malopolska" group—French)	Glinik Mariampolski	1,250	S-W	None
	Jedliczo	850	S-L	None
	Trezabinia	2,500	S-L	None
	Jaslo (reconstructed)	1,000	S-L	None
(Formerly owned by the Fink group—Polish)	Ligota	250	S-L	None
Total Poland		7,100		None

PORTUGAL

S. A. Concessionaria da Refinacao de Petroleos em Portugal, Rua do Alecrim 57, Portugal	Cabo Ruivo	*7,000	S	None

*Considering capacity increase.

ROMANIA*

Astra Romana, S. A. 32, Boulevard Regele Carol 1, Bucharest	Ploesti	25,000	Comp.	12,000
Colombia Soc. Franco-Rumanine de Petrol, 10 Rue Romania, Bucharest	Ploesti-Sud	10,000	S-C	5,000
Concordia Soc. An. Rumaine pour l'Industrie due Petrole, Strada Matei Millo, 15, Bucharest	Ploesti-Nord	29,000	S-C	4,200
Creditul Miniere, Soc. An. Rumaine pour le Development de l'Industrie Miniere, Boulevard Bratianu 16, Bucharest	Brazi-Prahova	11,000	Comp.	3,500
Dacia Romano Petroleum Synd., Ltd., 83 Cannon St., E.C. 2, London; Cantacuzino 33, Bucharest	Ploesti-Nord	5,000	S	None
Neo Petrole Fratia	Ploesti-Sud	3,000	S	None
"Petrol Block" S.A.R., Strada Nicolae Golescu, 7, Bucharest	Ploesti	8,500	S-C	4,000
Petrol Latina S.A.R., Bucharest	Ploesti	3,000	S	None
"Photogen" Rafineria de Petrol, S.A. (Socony-Vacuum) Str. Juli Maniu 104-108, Brasov	Ploesti-Nord	3,500	S	None
Romano-Americana, S.A., 126 Calea Victorei, Bucharest	Teleajen	18,000	S-C-L-A	8,000
"Romano-Belgiana Depetrol" S.A. Strada Biserica Amzel 28, Bucharest	Ploesti	5,000	S	None
Spies Petroleum Co., Ltd., 17 Waterloo Place, S.W. 1, London	Campina	31,000	Comp.	6,300
Steaua Romana S.A., pour l'Industrie du Petrole, Blvd. Carol 17, Bucharest	Moinesti	2,000	S	None
"Unirea" S.A.R. de Petrol (Phoenix Oil & Transport Co., Ltd., London), Casuta Postala, 1, Ploesti	Ploesti	7,000	S-C	...
		14,000	S-C	7,000
		3,500	L-A	...
Total Romania		178,500		50,000

Official information on status of refining industry in U.S.S.R. controlled areas not available. Inforation from other sources indicate nationalized Romanian refineries have a combined capacity upwards of 150,000 bbl. daily.

SAUDI ARABIA

Arabian American Oil Co., Dhahran, Saudi Arabia	Ras Tanura	*131,000	S-C	20.000

*Alterations now under way are expected to increase current capacity (120,000) to 131,000 bbl. per day.

SCOTLAND

Shell Refining & Marketing Co., Ltd., Norman House, Strand, London, W. 1	Ardrossan	*4,300	A	None
Scottish Oils, Ltd. (Anglo-Iranian), 53 Bothwell St., Glasgow, C. 2	Grangemouth	†14,000	S-C	3.000
William Briggs & Sons, Ltd., Dundee	Dundee	‡1,000	L-A	None
Total Scotland		19,300		3,000

*Processing reduced crude. †Additional crude-oil capacity for increasing refinery to 35,000 bbl. per day planned for 1950-51. ‡Processing reduced crude to lubes and asphalts.

SPAIN

Compania Arrendataria del Monoplio de Petroleos, S.A. Torija, 9, Madrid	Cornella, Barcelona*	700	S-L-A	None

*Additional refineries for processing Middle East crudes planned.

SWEDEN

A. Johnson & Co., Postbox 52, Nynashamn	Nynashamn	11,000	S-C-C-A	2,900
A. Johnson & Co., Postbox 52, Nynashamn	Malmo	1,800	S-A	None
Stora Copeberg Co., Transatlantique	Goterborg	*5,000	S	None
Total Sweden		27,800		2,900

*Current plans call for capacity increase of 3,500 bbl. crude daily, in early 1949. Refinery reports current capacity at 1,500 bbl. daily.

TRIESTE

"Aquila" S.A. Tecnico-Industriale, Trieste	Trieste*	10,000	S-L	None
Standard Italo-Americana del Petrolio (Jersey Standard), 40 Via Assarotti, Genoa, Italy	Trieste	2,500	S-L-A	None
Total Trieste		12,500		None

*Expansion to 12,000 bbl. daily planned.

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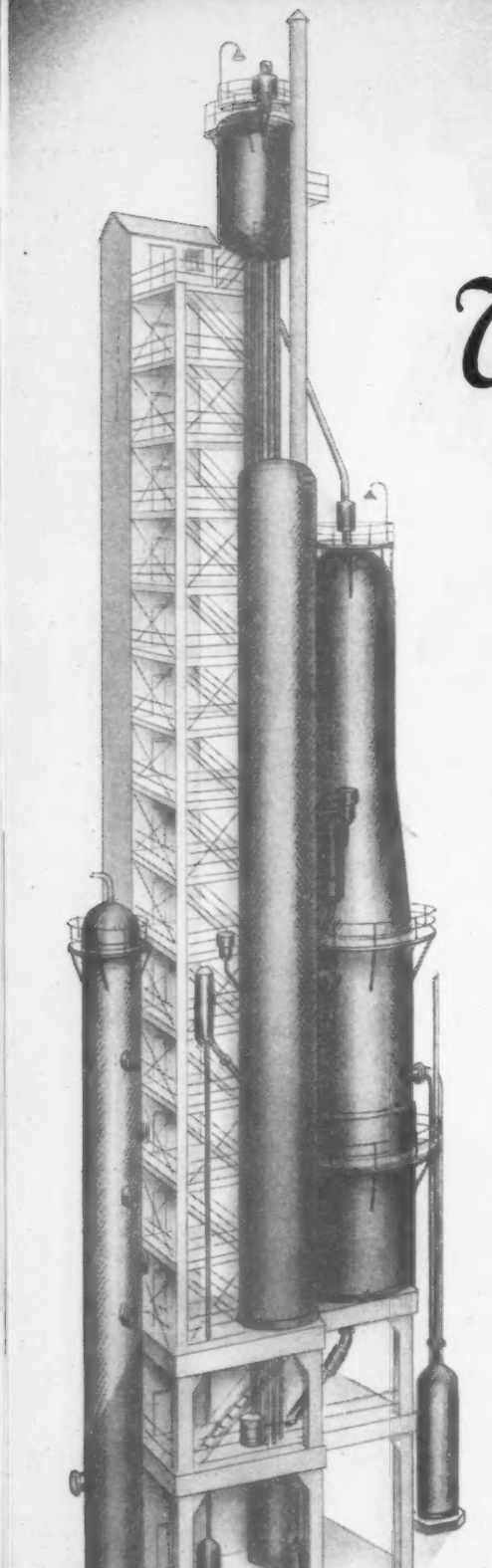

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TRINIDAD

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Kern Trinidad Oilfields, Ltd., 36-38 Kingway, London, W.C. 2	Guapo	1,000	S	None
Trinidad Leaseholds, Ltd., Salisbury House, Finsbury Circus, London, E.C. 2	Pointe-a-Pierre	*65,000	S-C	*50,000
Trinidad Lake Asphalt Operating Co., Ltd. (General Asphalt subsidiary), Barber, N. J.; Philadelphia	Brighton	1,000	S-A	None
Trinidad Oilfields Operating Co., Ltd., Port-of-Spain	La Brea	1,300	S	None
United British Oilfields of Trinidad, Ltd., St. Helen's Court, Great St. Helen's, London E.C. 3, England	Point Fortin	28,000	S-A†	None
Total Trinidad		96,300		50,000

*Total of 10,000 bbl. crude capacity and 10,000 bbl. reforming capacity is now shut down. †Vacuum asphalt plant now under construction and a second plant, consisting of continuous-blowing asphalt equipment, planned.

UNITED STATES

For data on refineries of the United States, see compilation published in The Oil and Gas Journal's Refining Number, April 1, 1948. Total United States operating refineries, 369, crude capacity 5,969,525 bbl. daily, cracking capacity 3,752,220 bbl. daily. 1949 Survey to be published March 24, 1949.

U.S.S.R.

No official information is available on current capacity of Russia's refineries. Prewar the U.S.S.R. had 13 refineries rated at 637,500 bbl. daily crude capacity and 178,500 bbl. per day cracking capacity. Present capacity of approximately 25 refineries is estimated at 650,000 bbl. per day of crude oil and 250,000 bbl. daily of cracking which includes both thermal and catalytic plants. During wartime and in the early postwar period, U.S.S.R. is reported to have moved a number of refineries into its prewar boundaries from countries in Eastern Europe.

URUGUAY

Administration Nacional de Combustibles, Alcohol y Portland, 25 de Mayo 409, Montevideo	Montevideo	*15,700	S-C	†2,000

*Current capacity approximately 9,000 bbl. daily. Additional capacity authorized. †Cracking plant operating in topping service. New topping unit planned for 1949.

VENEZUELA

British Controlled Oilfields, Ltd., San F. at Pajaritos No. 15, Caracas	Mene Mauroa	250	S	None
Colon Development Co., Ltd., Mijares a Mercedes 25, Caracas	Casigua	700	S	None
	La Rivera	200	S	None
	El Cavario	200	S	None
Creole Petroleum Corp., Apt. 889, Caracas	Amuay Bay	*60,000	S-C-L-A	.....
	Caripito	54,000	S-C	24,000
	La Salina	10,000	S-A	None
Mene Grande Oil Co., Apartado 234, Maracaibo	Cabimas	1,800	S	None
	Oficina	830	S	None
Shell Caribbean Petroleum Co., Inc., 117 Main St., Flemington, New Jersey, U.S.A.	San Lorenzo	41,000	S	None
	Punta Cardon	*40,000	S-C	.....
Socony-Vacuum Oil Co., Salas a Caja de Agua 59, Caracas	Guario	120	S	None
Texas Petroleum Co., Tienda Honda a Punte 59, Caracas	Tucupita	10,000	S	None
Total Venezuela		219,100		24,000

*Building.

Note—Mene Grande Oil Co. and Sinclair Oil Corp. are reported planning to construct refineries of 20,000 and 35,000 bbl. daily capacity respectively at Puerto La Cruz.

WALES

National Oil Refineries, Ltd., Britannic House, Finsbury Circus, London, E. C. 2	Llandarcy	*62,000	Comp.	4,000

*Current capacity 17,000 bbl. per day. Additional 45,000 bbl. per day capacity under construction. Lubricating oil manufacturing facilities to be increased by 1952.

WEST INDIES

Aruba

Lago Oil & Transport Co., Ltd., San Nicolas, Aruba	Aruba	390,000	S-C-A	200,000
Arend Petroleum Mij., Willemstad, Orarjestad, Aruba	Druif, Aruba	27,000	S-C	*3,000
Total Aruba		417,000		203,000

*Operating currently as distillation unit.

Curacao

N. V. Curacaosche Petroleum Industrie Mij., Carl van Byjlandtlaan 30, The Hague	Willemstad	200,000	S-C-L-A	*100,000

*Currently operating in topping service.

YUGOSLAVIA*

Ivanovic & Co., Belgrade	Osijek	550	S	None
Raffineria di Olii Minerili (A.G.I.P.), Fiume	Fiume	2,500	S-L-W	None
Shell Oil Co. of Jugoslavia, Ltd., Zagreb	Sisak (Caprag)	2,000	S	None
Standard-Vacuum Oil Co. of Yugoslavia, Inc., Zagreb	Brod	2,250	S	None
Sumadiska Kreditava, Belgrade	Smederevo	1,000	S	None
Total Yugoslavia		8,300		None

*Official information on refinery operations in Yugoslavia like that in other U.S.S.R. controlled regions is not available. Estimates indicate refining capacity in Yugoslavia is approximately 8,500 bbl. per day.

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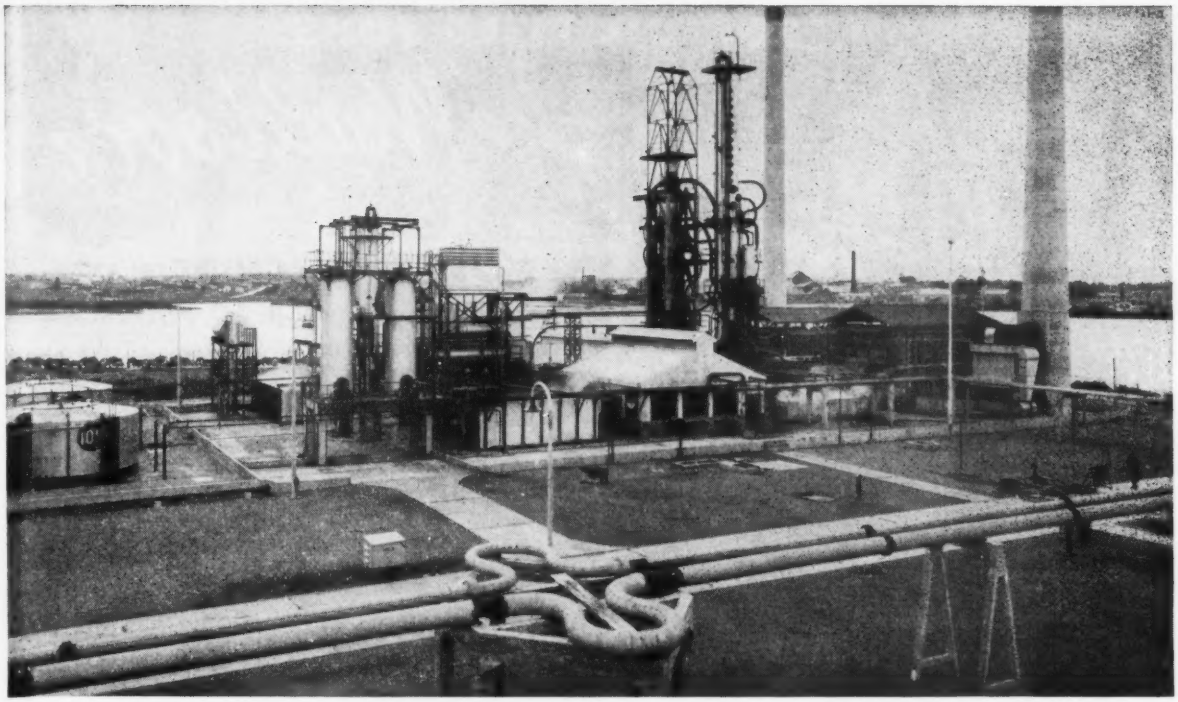


View of revamped Ancap refinery, Montevideo, Uruguay—current capacity 9,000 bbl. daily, additional capacity authorized to raise throughput to 15,700 bbl.

Refining SOUTH AMERICAN CRUDES

by Gustav Egloff*

PRODUCTION of petroleum in the American countries south of the United States is on the increase and the application of modern refining processes to assure its maximum utilization is important in view of increased demands for petroleum products.

Venezuela has the largest oil production of any Latin-American country. The next largest comes from Mexico which is also rapidly expanding both production and refining capacity. The balance between domestic needs and foreign shipments varies widely in Latin-American countries. Venezuela's production far exceeds domestic requirements, but Argentina uses practically all of its production at home. Peru, Ecuador, and Colombia are oil-exporting countries. Production in Brazil is still small but extensive explorations are in progress because of high demand, and Chile is developing new discoveries in the Terra del Fuego area.

Table 1 shows the production of petroleum in Latin-American countries in 1947 and 1948. The data show that from 1947 to 1948 oil output increased 11 per cent. Production in Chile has not been reported for either year, though it is known that the Spring Hill wildcat well in the south originally flowed 8,000 bbl. a day in 1946 and that other producing wells have been brought in.

In general, the refining of Latin-American crudes presents the same problems as the refining of crudes in the United States, since they vary widely in quality. Some are highly paraffinic and others are highly asphaltic, with intermediate gradations.

TABLE 1—LATIN-AMERICAN CRUDE PRODUCTION, 1947-1948

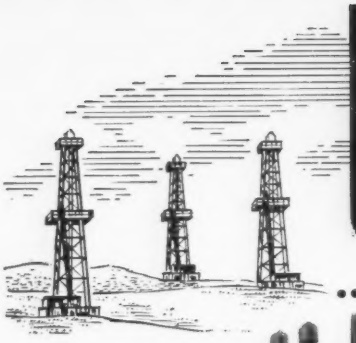
	Bbl. 1947	Bbl. 1948
Venezuela	435,236,000	486,780,000
Mexico	57,000,000	58,560,000
Colombia	25,273,000	22,692,000
Argentina	21,551,000	23,248,000
Trinidad	20,260,000	20,496,000
Peru	12,803,000	13,908,000
Ecuador	2,281,000	2,708,000
Bolivia	380,000	476,000
Brazil	94,000	110,000
Total	517,564,000	628,978,000

As in the United States, crude-oil characteristics show marked variations in the same field and at different producing levels. The same methods of processing crude employed in the United States are used in refining Latin-American crudes.

Venezuela

In Venezuela, the heaviest production is still taking place in the Lake Maracaibo region where the crudes are typically asphaltic, but production is increasing in other fields in Central and Eastern Venezuela, where the crudes are generally more paraffinic. In the Maracaibo basin there are crude oils with 10° A.P.I. gravity and others with gravity as high as 40°. In the lake fields thus far, the heaviest crudes have been found in the Bolivar Coastal region, and the lightest in La Concepcion field. The crudes from the high producing area of Lagunillas are generally low gravity. Indicative of the variations in the quality of Venezuelan crudes, a few have been listed in Table 2: In this table the crude oils are listed in order of in-

*Universal Oil Products Co.



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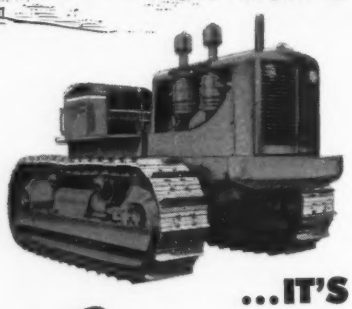

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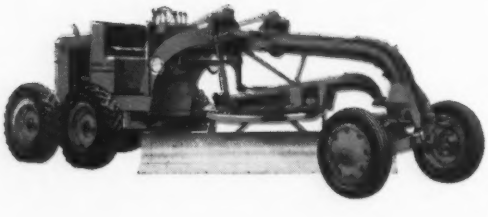

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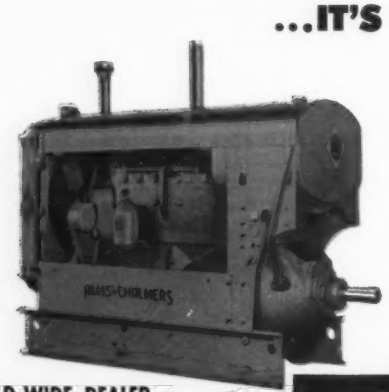

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TABLE 2—PROPERTIES OF VENEZUELAN CRUDE OILS

Field—	Lagunillas	Oficina	La Rosa	Colon	Temblador	Jusepin	Cumarebo
Crude oil:							
Gravity, °A.P.I.	16.9	22.3	23.3	31.4	32.0	33.4	47.5
Specific gravity at 60° F.	0.9535	0.9200	0.9141	0.8686	0.8654	0.858	0.7905
Per cent total sulfur	2.37	0.90	1.70	0.89	1.0	0.55	0.11
B.s. and w., per cent	0.4	0.1	0.1	0.4	.....	0.4	0.2
Cold test, °F.	Below 0	Below 0	Below 0	Below 0	10	Below 0	30
I.b.p., °F.	215	210	166	150	120	77	122
10 per cent	445	401	336	282	255	255	198
50 per cent	692	670	684	654	580	.....	405
90 per cent	.....	724	.....	716	.....	.....	698
Per cent coke by weight	10.7	7.4	8.0	6.5	.....	.....	.....
Composition of Venezuelan crudes—							
Straightrun gasoline:							
Volume per cent of crude	5.7	31.0	16.0	22.2	12.1	24.0	50.9
Gravity, °A.P.I.	35.2	56.5	56.9	58.8	52.2	58.9	62.7
Specific gravity at 60° F.	0.758	0.7527	0.7511	0.7436	0.7703	0.743	0.7286
Per cent total sulfur	Below 0.1	0.02	Below 0.1	0.03	0.03	.....	0.02
Octane numbers:							
F-2 (Motor) clear	.....	57	55	46	65.5	60	54
100 ml. distillation:							
I.b.p., °F.	140	105	118	134	116	108	104
10 per cent	.....	173	190	190	195	171	150
50 per cent	.....	266	272	280	286	271	246
90 per cent	.....	353	346	354	364	359	356
End point, °F.	380	400	402	398	400	395	394
Kerosine:							
Volume per cent of crude	.....	.....	.....	13.6	17.7	10.0	.....
Gravity, °A.P.I.	.....	.....	.....	41.9	33.8	41.0	.....
Specific gravity at 60° F.	.....	.....	.....	0.8160	0.8560	0.8205	.....
Per cent total sulfur	.....	.....	.....	0.15	0.18	.....	.....
100 ml. distillation:							
I.b.p., °F.	.....	.....	.....	310	410	364	.....
10 per cent	.....	.....	.....	387	441	397	.....
50 per cent	.....	.....	.....	456	475	431	.....
End point, °F.	.....	.....	.....	542	567	517	.....
Gas oil:							
Volume per cent of crude	14.7	.....	.....	21.9	.....	21.5	.....
Gravity, °A.P.I.	33.0	.....	.....	32.8	.....	33.1	.....
Specific gravity at 60° F.	0.860	.....	.....	0.8612	.....	0.8595	.....
Per cent sulfur	0.60	.....	.....	0.75	.....	0.19	.....
100 ml. distillation:							
I.b.p., °F.	406	.....	.....	524	.....	453	.....
10 per cent	.....	.....	.....	560	.....	495	.....
50 per cent	.....	.....	.....	624	.....	552	.....
90 per cent	.....	.....	.....	732	.....	660	.....
End point, °F.	.....	.....	.....	750	.....	.....	.....
Topped or reduced crude:							
Volume per cent of crude	79.6	69.0	83.8	42.1	70.0	44.5	48.9
Gravity, °A.P.I.	11.9	23.0	18.3	18.7	15.8	19.3	35.4
Specific gravity at 60° F.	0.987	0.9159	0.9446	0.9421	0.9606	0.938	0.8478
Per cent sulfur	2.8	1.4	1.9	1.57	1.21	1.18	0.15
Cold test, °F.	.....	.....	.....	45	10	90	65
Viscosity S.S.F. at 122° F., sec.	1050	20	.....	230	134	120	.....

creasing A.P.I. gravity and generally decreasing sulfur content. The table shows the difference between the heavy oils from the western fields typified by Lagunillas and La Rosa as compared with the Cumarebo oil having 47.5° gravity. It is well to remember that the crudes have been selected as typical and that marked differences are found in each field.

Table 2 is also a condensed summary of the yields and properties of principal products obtained in laboratory distillations of the crude oils. It shows the expected increase in straightrun gasoline percentage with increase in gravity of the crude oil, although the yield from Oficina crude

TABLE 3—PROPERTIES OF POZA RICA CRUDE OILS

Crude No.	1	2	3
Gravity, °A.P.I.	30.8	31.2	30.9
Viscosity, Universal at 100° F. sec.	.....	.....	61.3
Sulfur, per cent	.....	1.66	1.78
B.s. and w., per cent	.....	0.5	0.50
Cold test, °F.	.....	10	5
Characterization factor	.....	11.9	11.93
100 ml. A.S.T.M. distillation:			
I.b.p., °F.	137	138	140
10 per cent	275	264	272
50 per cent	641	638	652
90 per cent	724	720	752
E.b.p.	724	720	760

Semicommercial distillation—	Vol. %	Gravity °A.P.I.	Vol. %	Gravity °A.P.I.	Vol. %	Gravity °A.P.I.
Gasoline	25.0	59.9	6.5	75.2	23.3	62.9
Naphtha	.....	.....	19.2	54.5	.....	.....
Kerosine	8.2	44.4	6.3	43.7	14.2	42.0
Gas oil	20.0	34.8	20.6	35.3	.....	.....
Reduced crude	46.0	15.3	46.7	16.5	60.9	19.6

TABLE 4—PROPERTIES OF CRUDES FROM ARGENTINA, COLOMBIA, PERU, ECUADOR, BOLIVIA, BRAZIL, AND CHILE

Country—	Argentina		Colombia,	Peru			Ecuador,	Bolivia			Brazil		Chile
Field—	El Sosneado	Comodoro Rivadavia	La Cira	Lobitos	El Condor	Agua Caliente	Santa Elena	Sanandita	Camiri	Itaparica	Candeais	
Crude oil:												
Gravity, °A.P.I.	11.2	28.0	25.0	36.7	37.2	43.9	41.2	41.7	54.7	34.1	29.0	39.2
Specific gravity at 60° F.	0.9916	0.8871	0.9042	0.8413	0.8388	0.8067	0.8193	0.8170	0.7599	0.8540	0.8816	0.8289
Per cent total sulfur	1.26	0.09	0.82	0.07		0.07	0.05	0.07	0.02	0.07	0.10	0.05
B.s. and w., per cent	0.7	.....	.....	Trace		0.02	None	.....	.....	.....	.....	.....
Cold test, °F	55	Below 0	Below 0	10		50	Below 0			85	90	60
I.b.p., °F.	266	215	210	176	160	132	142	116	110	212	220	155
10 per cent	586	334	361	269	240	224	238	216	174	350	412	276
50 per cent	699	682	694	535	494	502	478	518	328	686	697	532
90 per cent			745			727	714	752	648	753		898
Per cent coke by weight	13.1	7.4	5.5	1.2	1.6	2.2	1.4	1.2	1.5	3.7	6.8	.....

TABLE 5—COMPOSITION OF CRUDES FROM ARGENTINA, COLOMBIA, PERU, ECUADOR, BOLIVIA, BRAZIL, AND CHILE

	Argentina, Comodora	Colombia, La Cira	Peru, Lobitos	Peru, El Condor	Peru, Agua Caliente	Ecuador, Santa Elena	Bolivia, Sanandita	Bolivia, Camiri	Brazil, Itaparica	Brazil, Candeais	Chile	Chile
Straightrun gasoline:												
Volume per cent of crude	9.7	14.4	34.0	37.7	39.0	40.2	38.2	65.1	16.4	9.9	†11.15	‡16.77
Gravity, °A.P.I.	62.5	55.3	57.1	55.0	64.0	57.5	62.1	65.3	59.6	58.4	64.0	48.7
Specific gravity at 60° F.	0.7294	0.7575	0.7503	0.7587	0.7238	0.749	0.7309	0.7190	0.7405	0.7451		
Per cent sulfur	0.02	0.02	0.02		0.02	0.01	0.03	0.01	0.01	0.02	0.009	0.027
Octane numbers:												
F-2 (Motor) clear	42	62	60	57	38.5	54	50	45	32.5	44.5	65.8	30.1
I.b.p., °F.	143	104	148	138	112	110	96	103	100	132	116	274
50 per cent	237	275	255	270	264	262	248	247	290	281	191	333
90 per cent	285	352	328	352	360	346	343	345	363	360	226	376
End point, °F.	324	400	389	401	400	402	392	392	299	299	356	
Kerosine:												
Volume per cent of crude	20.2	1.6			14.5	15.0	12.0	16.4	8.0	7.4	24.7	
Gravity, °A.P.I.	46.9	41.5			44.6	42.0	41.2	44.0	46.1	45.2	39.7	
Specific gravity at 60° F.	0.7932	0.8179			0.8035	0.816	0.8193	0.8063	0.7967	0.8008		
Flash point tag closed cup, °F.					158	165	155	175	126	139	206	
Viscosity S.S.U. at 100° F. sec.	32.6	28.6			33	32.1		32.4	32.0	32.0	34	
I.b.p., °F.	323	353			418	399	406	422	402	397	437	
10 per cent	352	364			450	413	422	428	429	413	452	
50 per cent	403	385			472	436	444	454	457	443	478	
90 per cent	479	427			508	479	489	506	490	489	523	
End point, °F.	525	460			529	524	530	545	523	523	548	
Gas oil:									Lt.	Hvy.	Lt.	Hvy.
Volume per cent of crude	4.9	25.1			38.5		24.9	11.7	14.1	4.19	7.7	39.0
Gravity, °A.P.I.	36.2	31.7			34.1		34.8	35.7	40.3	33.1	39.0	32.5
Specific gravity at 60° F.	0.9438	0.8670			.8545		.8509	.8463	.8236	.8597	.8299	.8628
Per cent sulfur	0.05	0.35			0.11		0.05	0.04	0.08	0.08	0.07	0.07
Cold test	Below 0	Below 0			85		35	25	20	110	25	110
100 ml. distillation:												
I.b.p., °F.	487	438			542		515	545	505	546	503	604
10 per cent	504	468			606		540	551	522	659	527	681
50 per cent	522	533			727		585	582	549	795	554	787
90 per cent	554	621			865		585	582	599	912	603	882
End point, °F.	583	672			910		682	678	634	936	636	902
Topped or reduced crude:												
Volume per cent of crude	65.1	57.9	65.0	61.8	8.0	44.7	23.6	6.4	19.2	36.0	20.1	
Gravity, °A.P.I.	18.9	15.8	28.9	28.2	11.9	29.5	24.7	28.2	15.0	15.0	28.4	
Per cent sulfur	0.14	1.28	0.10		0.27	0.06	0.13	0.06	0.18			
Cold test, °F.	50	10	Below 0	Below 0		65	95	90	•124	•123	110	
Viscosity S.S.F. at 122° F.	339	1,200		15		15						

•Softening point, ring and ball, °F. †Light. ‡Naphtha.

is a little off line. The mercaptan sulfur of all tested gasolines was below 0.0003 per cent and all were sweet to the doctor test. The motor octane numbers of the gasolines apparently do not follow any definite plan, the highest rating of 65.5 being found in the Temblador gasoline, where the yield was only 12.1 volume per cent. The La Rosa gasoline had an octane number 10 points lower with a comparable yield from the crude. The Cumarebo gasoline showed an octane rating of 54, with a 50 per cent gasoline yield from crude, while the gasoline from Jusepin field had an octane rating of 60 with a 24 per cent gasoline yield. The sulfur content of the reduced crude from the lake fields was generally somewhat higher than those from the western fields, but again this does not follow a definite plan.

Mention may be made of the characteristics of oils from other Venezuelan fields. In the recently developed Tucupido field, eight wells are producing 5,000 bbl. a day of 39.6°-A.P.I.-gravity crude. In Quiriquire field, oil of varying gravity is found. The highest has been 38.2° and average current production is around 35° gravity. In some cases, oil from the same well has shown fluctuations. In Amana field in the lake area, the early production in 1946 was 31° A.P.I. gravity. Guario field produces crude oil of 43° to 44° gravity with a high wax content and a cold test of 86° F. Some of the upper sands give crude with wax contents while lower sands produce 18°-gravity oils with little or no wax. Some of the Mene Grande wells in Oficina field produce oil of nearly 50° gravity, though the average is lower. West Guario crudes in Oficina field include 37° to 58°-gravity oils with wax contents of from 6 to 12 per cent, nonwaxy crudes from 20° to 42° gravity, and asphaltic oils from 10° to 18° gravity.

Mexico

Mexican crude-oil production today comes principally from the Poza Rica fields at the southern end of the "Golden Lane." Crude oils from this district are of mixed base as indicated in Table 3, which shows properties and yields of major products from three typical Poza Rican crudes. Another important producing area is the Naranjos district in the southern section of the Tampico-Tuxpan region, which produces both paraffinic and asphaltic crudes. Most of these have A.P.I. gravities varying between 14° and 23° with an average of around 21°. These crudes yield 4 to 10 per cent gasoline, and have the high sulfur content characterizing Tampico crudes. The Naranjos crudes have from 3.5 to 4 per cent sulfur and about 4 per cent paraffin wax. Panuco field furnishes a heavy crude oil containing substantially no gasoline. A typical sample had an A.P.I. gravity of 12.7° and flash point of 125° F. in

TABLE 6—PROPERTIES OF POZA RICA CRACKING STOCKS

Cracking stock No.—	1	2	3	4	5
	Gas oil	Blend of reduced crude and kerosine	Blend of 87.5% T.C. 12.5% G.O	Wax distillate	Pressed distillate
Gravity, °A.P.I.	1	2	3	4	5
Sulfur, per cent	34.8	18.9	21.1	25.6	27.0
Flash (Cleveland), °F.	255				310
Viscosity (Furol), 122° F., sec.		69			
Viscosity (Universal), 100° F., sec.	40		426	88	74
Cold test, °F.	5	30	45	80	15
100 ml. A.S.T.M. distillation:					
I.b.p., °F.	450	420	462	292	512
10 per cent	501	534	568	554	577
50 per cent	567	717	676	701	671
90 per cent	666			760	760
E.b.p.	710	742		760	760
Coke, wt., per cent		9.5	7.6	1.2	

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TABLE 7—CRACKING OF POZA RICA STOCKS, OPERATING CONDITIONS, YIELDS AND PROPERTIES OF PRODUCTS

Cracking stock No.—	1	2	3	4	5
Operating conditions:					
Temperatures, °F.:					
Heavy-oil transfer	937	920	920	910	940
Light-oil transfer	968	950	1,000	985	970
Pressures, psi.:					
Heavy-oil exit	260	200	250	200	200
Light-oil exit	400	250	250	300	350
Yields, volume per cent charge:					
Gasoline	57.1	39.3	39.7	55.9	57.9
Residuum	21.1	55.2	50.1	33.0	26.2
Gas and loss	21.8	7.5	10.2	11.1	15.9
Gas, cu. ft. per bbl. charge	836	394	466	575	640
Untreated gasoline:					
Gravity, °A.P.I.	61.2	61.6	61.1	61.5	61.3
Vapor pressure (Reid), psi.	10.3	10.9	9.4	10.9	15.0
Sulfur, per cent	0.13	0.19	0.19	0.21	0.22
Octane No.:					
Research	78				78
A.S.T.M.	70	69	70.1	70	71
3 ml. TEL/gal.			77.1		
100 ml. A.S.T.M. distillation:					
I.b.p., °F.	101	98	94	93	88
10 per cent	140	129	128	134	132
50 per cent	234	240	234	240	242
90 per cent	340	347	378	330	364
E.b.p.	400	397	396	336	400
Residuum:					
Gravity, °A.P.I.	1.7	8.3	6.9	1.8	0.9
Flash (Cleveland), °F.					300
Viscosity (Furol), 122° F., sec.	60	291	238	143	172
Cold test, °F.	40	40	40	30	35
B.s. and w., per cent	0.3	1.4	0.3	0.4	0.7

the Cleveland open cup and a viscosity of 499 seconds Furol at 122° F. Its cold test was 30° F. and it contained about 1 per cent b.s. and w. and 0.8 per cent water.

A recent oil discovery has been made in the north of Mexico near the town of Reynosa not far from the United States border. Production of a 50°-A.P.I.-gravity crude was obtained from a depth of 7,000 ft. Initial flow rate was 1,000 bbl. daily but the well is now capped. Another well is drilling and it is believed that a major field has been found.

The distinguishing properties of crude oils from several of the other Latin-American countries are shown in Table 4.

The yield of principal products from the primary distillation of these crude oils is summarized in Table 5.

Thermal Cracking

Table 6 shows the principal properties of five Poza Rican oils which were cracked in a two-coil thermal cracking plant. The operating conditions in these runs are given in Table 7 along with the yields of principal products and their characteristics. The A.S.T.M. octane numbers of the gasolines average around 70 and the addition of 3 cc. of tetraethyl lead per gallon raised the octane number 7 points in one case.

The ANCAP refinery at Montevideo, Uruguay, operates on crude oils from Peru, Ecuador, and Venezuela. The first two are paraffinic in character and give yields of 30 per cent gasoline, 20 per cent kerosine, 10 per cent gas oil, and 40 per cent residuum. The Venezuelan crudes received for processing are mixed base. The Temblador crude gives 4 per cent gasoline, 23 per cent kerosine and gas oil, and 73 per cent fuel oil, while the crude from Oficina field gives 52 per cent distillates, including 28 per cent gasoline.

The refinery contains a two-coil selective cracking unit of Universal Oil Products Co. design. The cracking plant processes 2,200 bbl. daily of mixed reduced crude. This charge has an A.P.I. gravity of 27.8° and a sul-

TABLE 8—VACUUM FLASH DISTILLATION OF LAGUNILLAS, VENEZUELA, REDUCED CRUDE

Properties of charge stock—	
Vol. per cent of crude oil, approx.	80-85
Gravity, °A.P.I.	12.7
Specific gravity, at 60° F.	0.9813
Sulfur, wt. per cent	2.55
Pour point, °F.	10
Cold test, °F.	5
Furol viscosity, at 122° F.	605

TABLE 9—VACUUM FLASH DISTILLATION OF LAGUNILLAS, VENEZUELA, REDUCED CRUDE

Yields and properties of fractions—			
Temperature, °F.	590	630	675
Overhead fractions:			
Yield, vol. per cent of reduced crude	38.0	44.0	55.4
Gravity, °A.P.I.	23.3	21.9	20.9
Sp. gravity, at 60° F.	0.9141	0.9224	0.9285
Sulfur, wt. pct.	1.53	1.60	1.94
Pour point, °F.	—25	—20	—30
Cold test, °F.	—30	—25	—35
Pensky Martens flash point, °F.	205	230	145
Conradson carbon, wt. pct.	0.08	0.17	0.46
Universal viscosity at 100° F., sec.	83	122	171
100 ml. distillation:*			
I.b.p., °F.	410	436	410
10 per cent	523	550	565
50 per cent	687	725	759
90 per cent	825	860	903
Pct. bottoms and coke	2.0	5.0	3.04
Bottoms fractions:			
Yield, vol. pct. of reduced crude	62.0	55.2	44.6
Gravity, °A.P.I.	7.6	5.7	1.3
Sp. gr. at 60° F.	1.0172	1.0313	1.0655
Sulfur, wt. pct.	3.07	2.99	3.27

*By vacuum distillation at 2-3 mm. Hg. converted to atmospheric temperature.

fur content of only 0.1 per cent. The cracking conditions are 915° F. for the heavy-oil heater and 975° F. for the light-oil heater with a pressure of 300 psi. on the reaction chamber.

Thermal Reforming

The thermal reforming process is readily adaptable to improving the octane numbers of Latin-American naphthas. A pilot plant run was made on a gasoline from the primary distillation of Naranjos crude. For a 56.4 per cent yield of gasoline the motor-method octane number was raised from 41 to 75. To this can be added 8 per cent of gasoline made by polymerizing the higher olefins in the gas so that the yield can be around 65 per cent.

A study was made of thermal reforming of an Argentina straightrun naphtha with a boiling point range between 250° and 385° F. The yield of reformed gasoline was 78.5 per cent and the motor-method octane number was raised from 38 to 36, the research method rating being 6 points higher. The charge was a low-sulfur naphtha and both total and mercaptan sulfur were low in the reformed product.

TABLE 10—U.O.P. FLUID CATALYTIC CRACKING

Properties of charge stocks and yields—	Lagunillas, Venezuela
Volume per cent of crude	46
Range in crude distillation, pct.	18-64
Gravity, °A.P.I.	20.9
Sulfur, per cent	1.94
Cold test, °F.	—35
Conradson carbon, wt. pct.	0.46
Universal visc. at 100° F., sec.	171
100 ml. distillation: (Vacuum converts to atmos. temp.):	
I.b.p., °F.	410
10 per cent	565
50 per cent	759
90 per cent	903
Yields, pct. of cracking unit charge:	
400° F. e.p. gasoline, vol. pct.:	
Debutanized basis	44.6
10-lb. R.v.p. basis	47.0
Cycle stock, vol. pct.	43.6
Ethane and lighter hydrocarbons, cu. ft. bbl. of charge	208
Conversion (100 vol. pct. charge stock)	56.4

TABLE 11—U.O.P. FLUID CATALYTIC CRACKING

Properties of products—	Lagunillas, Venezuela
Debutanized 400 e.p. gasoline (untreated):	
Gravity, °A.P.I.	53.4
Sp. gr. at 60° F.	0.7653
Total sulfur, wt. pct.	0.19
Mercaptan sulfur, pct.	0.002
R.v.p., lb.	5.1
Octane numbers:	
F-2 (Motor method) clear	80.6
+3.0 cc. TEL/gal.	84.2
F-1 (Research method) clear	92.0
+3.0 cc. TEL/gal.	95.3
100 ml. distillation:	
I.b.p., °F.	125
10 per cent	155
50 per cent	250
90 per cent	368
E.p., °F.	405
Cycle stock:	
Gravity, °A.P.I.	16.9
Sp. gr. at 60° F.	0.9535
Cold test, °F. Below	—30
Univ. visc. at 100° F., sec.	40.4
Sulfur, wt. per cent Approx.	1.9
100 ml. distillation:	
I.b.p., °F.	435
10 per cent	480
50 per cent	549
90 per cent	691

TABLE 12—NONSELECTIVE POLYMERIZATION OF GASES FROM FLUID CATALYTIC CRACKING, THERMAL CRACKING, AND THERMAL REFORMING

Process—	Thermal cracking		Thermal reforming,	Fluid cat. cracking,
	Temblador reduced crude	Sanandita reduced crude	Argentina naphtha	Lagunillas gas oil
Charge stock to cracking or reforming—				
Yields, volume per cent of charge stock to cracking or reforming unit:				
Propylene before polymerization	2.2	2.7	5.1	5.5
Butylenes before polymerization	1.9	3.6	5.7	4.3
Polymer:				
Debutanized	2.4	3.8	6.5	5.7
10-lb. R.v.p.	2.7	4.3	7.3	6.4
Excess butanes above 10-lb. R.v.p. polymer	—0.4	—1.4	—3.5	+1.7

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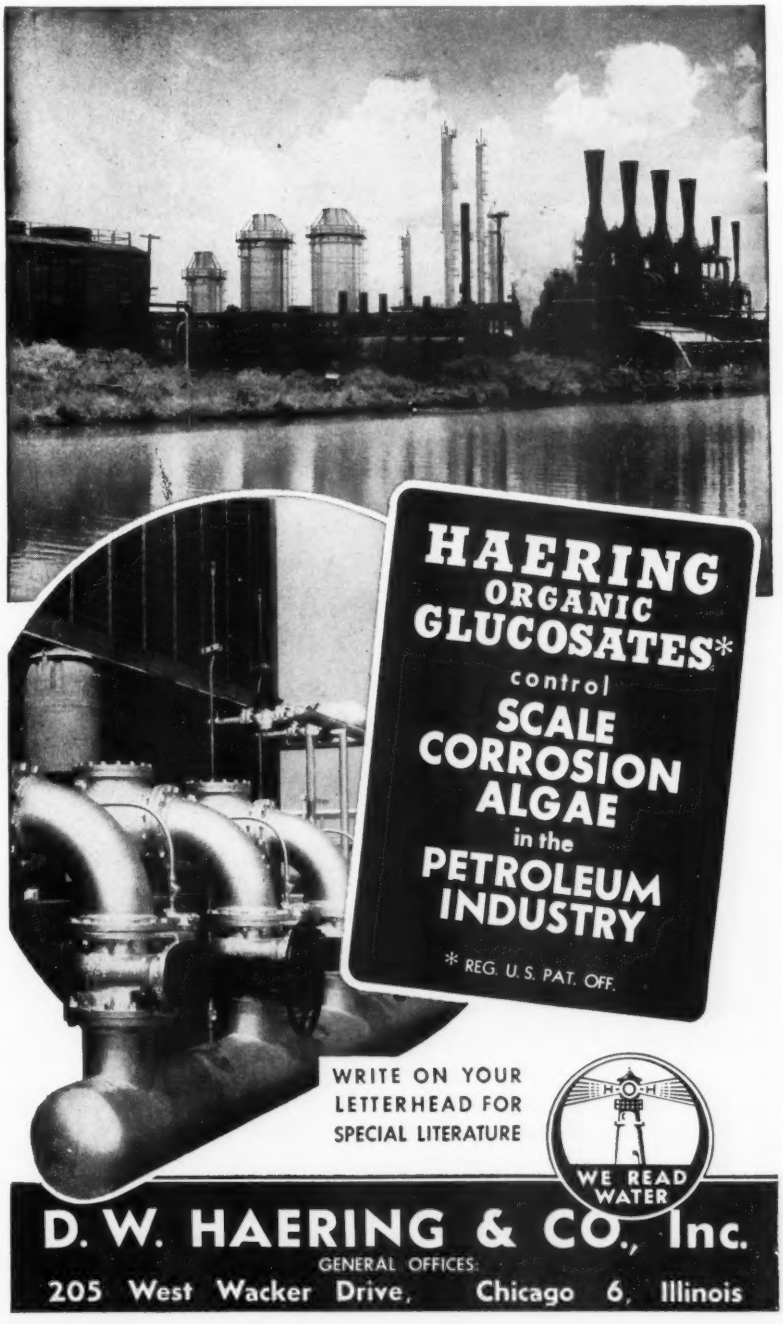

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the fluid-flow type of operation is showing the most rapid growth. This process is applicable to the cracking of distillate oils from any source to produce gasoline of 80 or higher motor-method octane number, increasing yields of polymerizable olefins and isobutane for alkylate manufacture. The process accomplishes a general upgrading of gas oil with minimum production of residual fuel and increasing production of gasoline and distillates suitable for diesel fuel or home heating oils. This adaptability to supply varying market demands is one of the most pronounced features of the process. By selecting operating conditions, maximum yields of motor fuels can be obtained or alternately decreased yields of less olefinic gasoline suitable for aviation base stock. Both natural clay and synthetic silica-alumina catalysts are used.

Fluid catalytic cracking was employed to process a Venezuelan reduced crude from Lagunillas field. A 12.7° A.P.I. reduced crude was vacuum flashed at an absolute pressure of 35 mm. at three different temperatures. The properties of the residuum are given in Table 8 and the results of the three vacuum-flashing runs in Table 9. As the temperature of flashing was raised, the yield of cracking stock increased from 38 to 55.4 per cent with a corresponding decrease in A.P.I. gravity from 23.3° to 20.9°.

As a test of the applicability of fluid catalytic cracking, the 20.9°-gravity vacuum-flashed distillate was processed in a pilot plant. The properties of the charging stock and yields of gas and gasoline are summarized in Table 10, and the properties of the gasoline and cycle stock in Table 11. The charging oil contained nearly 2 per cent sulfur but the sulfur content of the 400-e.p. gasoline was only 0.19 per cent while its mercaptan sulfur before treating, was only 0.0002 per cent. The motor-method octane number of the gasoline product was 80.6 without tetraethyl lead and the research method number was 92. The cycle stock had a gravity of 16.9°, indicating its cyclic hydrocarbon character.

Catalytic polymerization is now an indispensable adjunct to both thermal and catalytic cracking plant operations since yields of gasoline can be increased 2 to 5 per cent by processing the propane, propylene, butane, butylenes fraction of the cracked gases with solid phosphoric-acid catalyst. The polymers have octane ratings of from 80 to 82 motor method and have still higher blending values. Table 12 summarizes in condensed form, the yields of propylene and butylenes from the cracking of three South American stocks, and the yield of polymer from polymerization.

In Table 13 yield data and calculated figures are given to show the percentage of high-octane alkylate derived from the gases obtained in the

fluid catalytic cracking of Lagunillas vacuum-flashed gas oil. The alkylate obtainable from the isobutane in the

TABLE 13—ALKYLATION OF ISOBUTANE WITH BUTYLENES FROM FLUID CATALYTIC CRACKING OF LAGUNILLAS GAS OIL

Cracking products—	% Yields based on Lagunillas gas oil
Butylenes	4.3
Isobutane	3.6
n-Butane	1.0
Alkylation products—	
Case I—Isobutane limiting, no isomerization:	
Depentanized 350° F. e.p. alkylate	4.3
Excess butylenes after alkylation	1.4
Case II—Alkylation of all butylenes, including isomerization:	
Depentanized 350-e.p. alkylate	6.6

gases is 4.3 per cent of charge to the cracking unit. This yield can be increased to 6.6 per cent if the normal butane in the gases is isomerized, and still further if the 1 per cent isobutane deficiency is made up from outside sources. The octane rating of alkylate by the motor method is from 90 to 95. Alkylate boiling range is from about 150° to 350° F., and it requires the addition of isopentane for increasing its vapor pressure.

BOOKS

PARKING FOR SMALLER CITIES—A FACTUAL GUIDE. Published by Associated Retailers of Indiana, 808 State Life Building, Indianapolis. 138 pp. $2.50.

This manual is designed to provide a guide for parking-solution committees, and gives, in ready reference form, in layman's language, the essential facts on all phases of the problem. It is very largely based on the recent study completed for small cities by the Public Roads Administration.

THE NATURE AND ORIGIN OF LIMESTONE POROSITY. By Richard B. Hohlt. Published by Colorado School of Mines, Golden, Colo. 52 pp. $1.

This booklet is a regular quarterly of the school. The 20 illustrations photomicrographs and petrofabric diagrams prepared in the course of the research. Although petroleum has been produced from limestone reservoirs for many years, adequate basic knowledge concerning the origin and behavior of carbonate reservoirs is yet to be disclosed. This paper analyzes the existing concepts and presents evidence for the modification or expansion of some of these concepts.

1948 A.S.T.M. STANDARDS ON BITUMINOUS MATERIALS FOR HIGHWAY CONSTRUCTION, WATERPROOFING, AND ROOFING. Published by American Society for Testing Materials, 1916 Race Street, Philadelphia. 317 pp. $3.

This new compilation is sponsored jointly by Committee D-4 on Road and Paving Materials and Committee D-8 on Bituminous Waterproofing and Roofing Materials. Besides covering all the standard and tentative specifications, test methods, recommended practices, and definitions of terms in the fields covered by these two committees, there are given those standards covering creosote materials which are under the jurisdiction of Committee D-7 on Wood, but are of direct interest to the highway-construction field.

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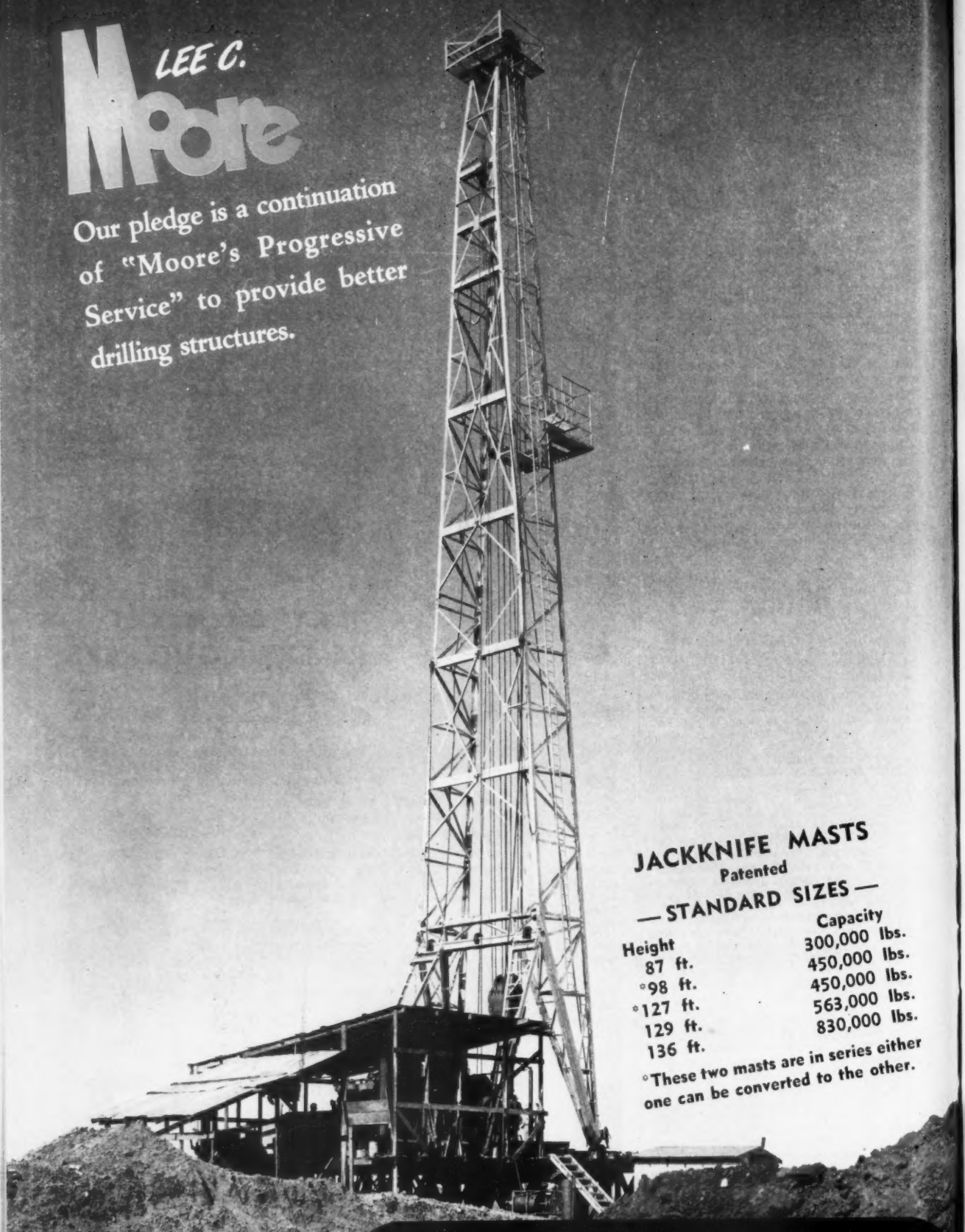

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JOURNAL-Series ON Petroleum Engineering Time Savers

9. Chart for Simplified Material-Balance Equation--High Fractional Withdrawals

THIS chart, as was the one preceding it, is based upon the material-balance equation for no gas cap and no water drive:

$$n/N = \frac{u - u_o}{u + (r_p - r_o)\,v} \qquad (1)$$

where

n/N = fractional stock-tank oil produced at present time

u = two-phase formation-volume factor at present time

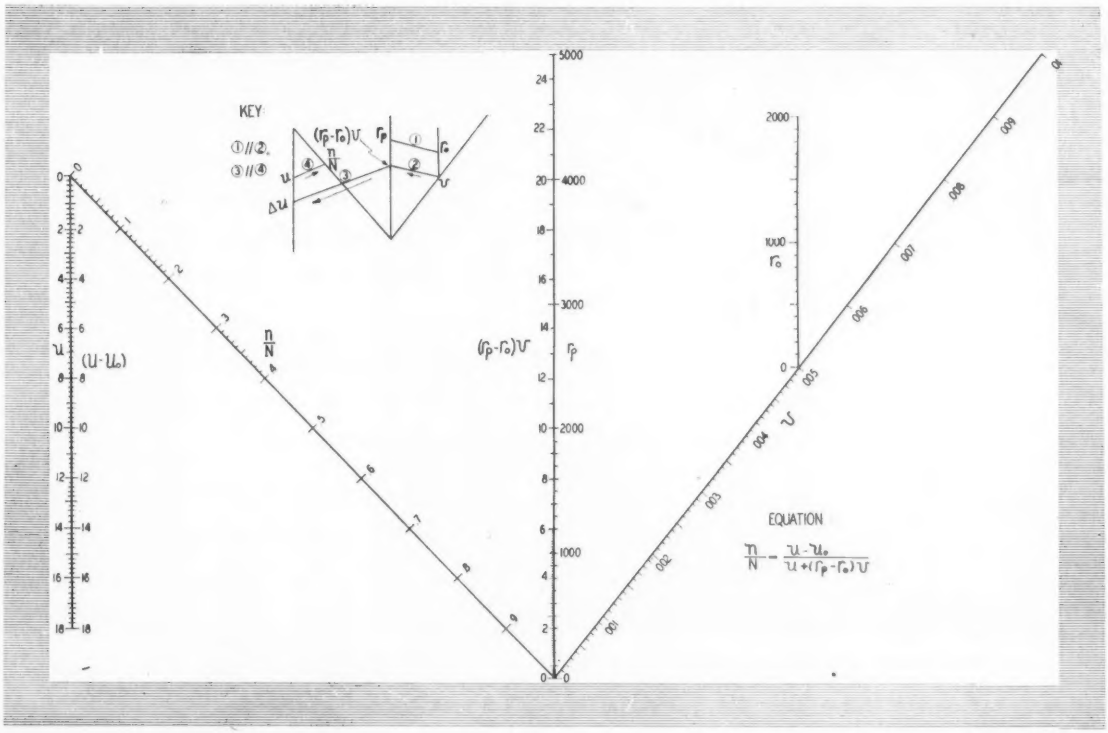
u_o = two-phase formation-volume factor at original reservoir pressure

r_o = gas in solution at original reservoir pressure, standard cubic feet per stock-tank barrel

r_p = the cumulative net gas-oil ratio, standard cubic feet per stock-tank barrel

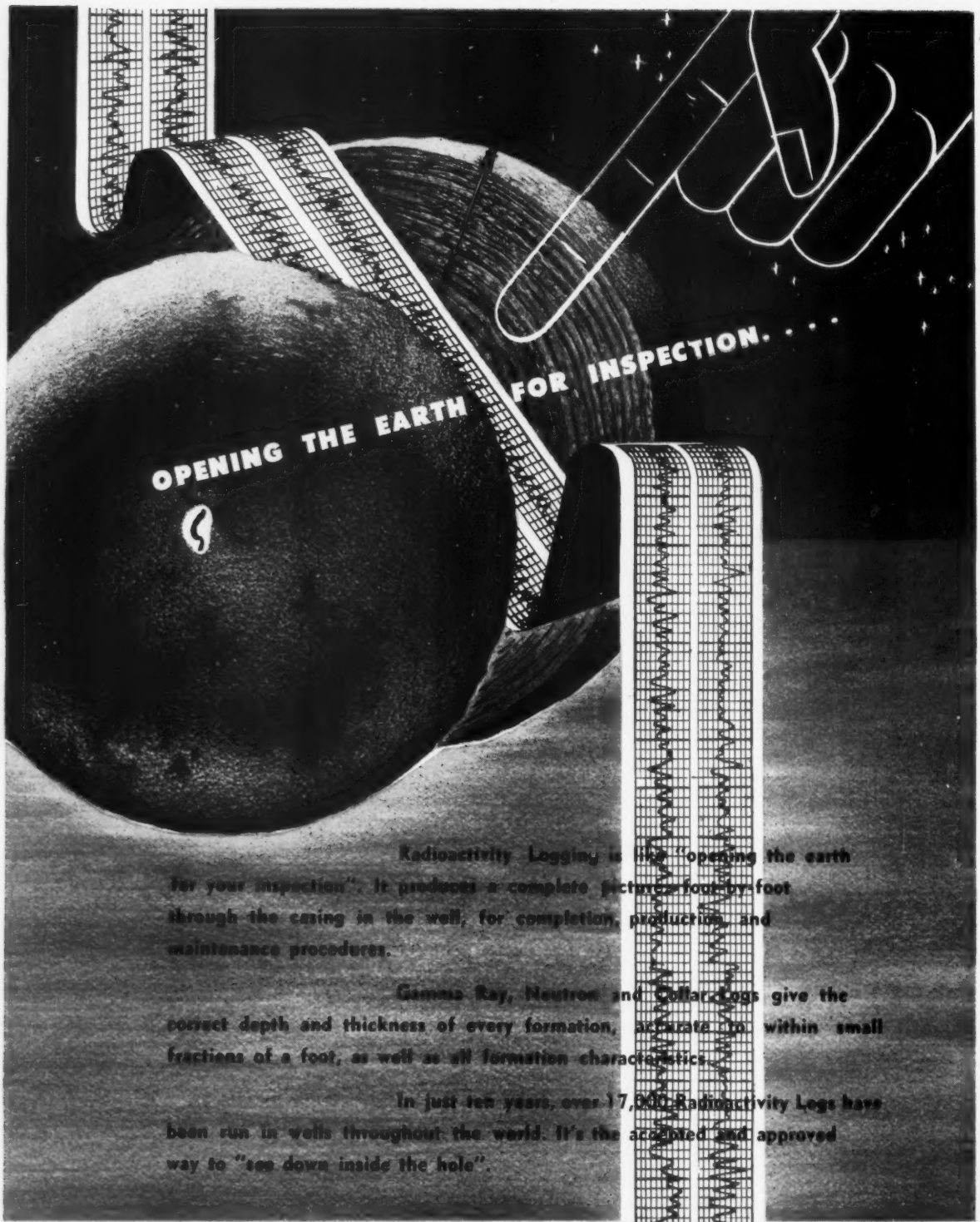
v = gas conversion factor from standard cubic feet to barrels in reservoir at present time

The range of variables have been chosen to allow predictions of relatively high fractional withdrawals. The Δu scale is equivalent to $(u - u_o)$. The Δu and n/N scales can be used in multiples of 10 provided both are so used. This arrangement frequently allows more accurate reading of scales when the Δu value is a small number, or an excessively large number. Since the scales are mostly linear they can easily be extended from the ranges given. An example problem has been worked out on the previous chart.



(Chart by R. C. Newman, G. Pernalete, and R. M. Caywood, University of Oklahoma.)

Series by Dr. John C. Calhoun, Jr., Chairman Petroleum Engineering School, University of Oklahoma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ENGINEERING fundamentals

Use of K_g/K_o Ratio in Gas Drive

IN a previous Engineering Fundamentals (No. 356) a general relationship between gas-oil ratio, cumulative oil, and pressure was developed. This equation was:

$$C = \left(\frac{\log a - \log (R-r)\,\mu_g/\mu_o\, v/\beta}{b\beta}\right)_1 - \left(\frac{\log a - \log (R-r)\,\mu_g/\mu_o\, v/\beta}{b\beta}\right)_2 \quad (1)$$

and is subject only to the limitation of the validity of the gas-oil ratio equation and the k_g/k_o relationship:

$$k_g/k_o = ae^{-bS_o} \quad (2)$$

Useful engineering concepts are derived from Equation 1 when certain simplifying assumptions are made. Consider at first a reservoir at constant pressure (β, μ_g/μ_o, v are then constant). Equation 1 under this condition reduces to:

$$C = \frac{1}{b\beta}\,[\log (R-r)_2 - \log (R-r)_1] \quad (3)$$

Furthermore, if the gas in solution, r, is negligible compared to the total produced ratio, R, then the equation becomes:

$$C = \frac{1}{b\beta}\,(\log R_2 - \log R_1) \quad (4)$$

or $\log R_2 = \log R_1 + b\beta C$

which is a linear relationship between the cumulative oil produced over an interval when the gas-oil ratio has advanced from R_1 to R_2 at constant pressure. The type graph is shown in Fig. 1.

This relationship is useful in gas drive prediction work since the slope of the relationship is $b\beta$. The value of b is known from the k_g/k_o curve and β from the pressure at which the gas drive is carried on.

If the situation is further simplified by assuming that the rate of gas flow is a constant per unit of time, Equation 4 can be put into a slightly different form. The ratio R is equal to Q_g/Q_o, both of which rates are per unit of pore volume. Substituting this in Equation 4 and assuming Q_g to be constant with time gives the following:

$$C = \frac{1}{b\beta}\left(\log \frac{1}{Q_2} - \log \frac{1}{Q_1}\right) \quad (5)$$

or $\log Q_2 = \log Q_1 - b\beta C$

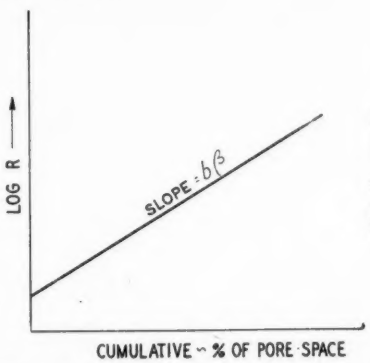

Fig. 1—Type graph for dependence of gas-oil ratio on cumulative during gas drive

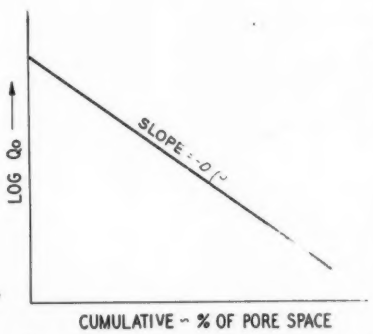

Fig. 2—Type graph for dependence of production rate on cumulative during gas drive

which is a statement that the rate of oil production should vary logarithmically with the cumulative production. Fig. 2 is a type graph. Again this relationship is useful for predicting a gas drive and in summary is valid for the conditions of (1) a constant pressure operation, (2) a constant rate of gas throughput, and (3) a negligible value of gas in solution.

Instances are reported in the literature where the relationships of Equations 4 and 5 are at least approximated and which lead to values of b which are of correct order of magnitude. Fig. 3 is a graph of log R versus cumulative production, and log of production rate versus cumulative production. This data is taken from Fig. 29, page 227, Secondary Recovery of Oil in the United States, and represents that portion of the curve after final decline had set in. A value of b cannot be calculated here because the cumulative is not known as a fraction of the pore space, as would be necessary for substitution in Equations 4 and 5.

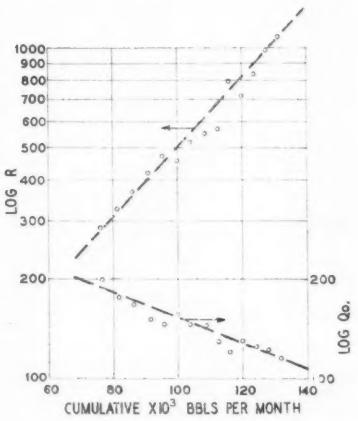

Fig. 3—Field data plotted according to Equations 4 and 5

Equations 4 and 5 state that the slopes of the graphs in Fig. 3 should both be $b\beta$ in value and opposite in sign. Actually the slopes are not equal, perhaps due to the fact that R values are based on gas injection figures rather than production figures, and also due to the possible occurrence of bypassing of gas which would invalidate the applicability of Equation 2.

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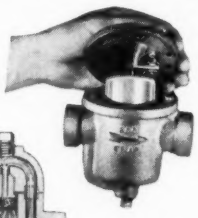

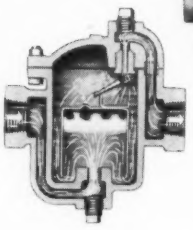

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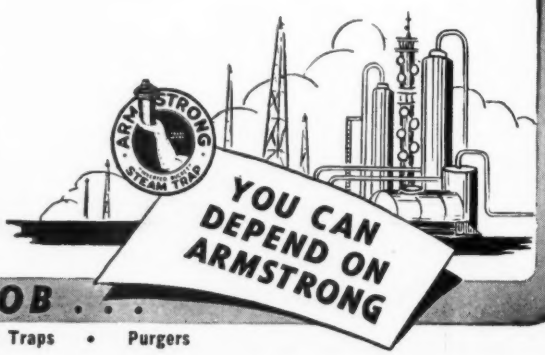

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Cost-imating

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Fractionating Towers

Note—The cost or weight of shells, heads, manholes, and connections of vessels were indicated in Cost-imating No. 10 of December 23, 1948. Here are additional data that pertain directly to fractionators.

TABLE 1—APPROXIMATE FRACTIONATING TOWER DATA

Inside diameter	Tray supports, lb. C.I.[1] trays	Tray supports, lb. Steel[2] trays	Tray supports, lb. Alloy[2]	Insulation rings,[3] lb. each*	Foundation ring, etc. lb.[3]	Downspouts steel, lb.[3]	Tray, lb. C.I.[1]	Tray, lb. Steel[2]†	4-in. C.I. caps, per tray[5]
2 ft. 6 in.	...	...	...	21	136	45	250- 300	130	16
3 ft. 0 in.	...	...	...	24	161	63	320- 430	180	21
3 ft. 6 in.	...	...	...	28	187	83	470- 600	234	30
4 ft. 0 in.	75	...	75	32	212	100	630- 750	296	41
4 ft. 6 in.	112	...	...	35	238	121	800-1,000	365	53
5 ft. 0 in.	125	...	100	39	263	139	1,000-1,200	441	68
5 ft. 6 in.	135	...	120	43	289	160	1,250-1,450	524	83
6 ft. 0 in.	325	...	140	46	315	178	1,500-1,700	615	99
6 ft. 6 in.	350	...	...	50	340	197	1,750-1,950	713	115
7 ft. 0 in.	375	...	180	54	366	216	2,000-2,250	818	135
7 ft. 6 in.	...	...	...	57	391	235	2,250-2,500	931	151
8 ft. 0 in.	...	...	...	61	417	252	2,550-2,800	1,052	176
8 ft. 6 in.	...	157	...	65	834	271	2,850-3,100	1,179	206
9 ft. 0 in.	...	166	...	69	865	289	3,500-3,750	1,313	237
9 ft. 6 in.	...	175	...	73	896	306	3,850-4,100	1,455	270
10 ft. 0 in.	...	184	...	77	1,391	323	4,250-4,500	1,604	307
10 ft. 6 in.	...	194	...	80	1,437	340	4,600-4,850	1,760	343
11 ft. 0 in.	...	406	...	84	1,484	357	.....	1,924	380
11 ft. 6 in.	...	424	...	88	1,530	374	.....	2,095	420
12 ft. 0 in.	...	442	...	91	1,577	389	.....	2,273	462
12 ft. 6 in.	...	460	...	95	1,623	405	.....	2,458	505
13 ft. 0 in.	...	480	...	99	1,670	420	.....	2,650	550
13 ft. 6 in.	...	498	...	102	1,716	435	.....	2,851	596
14 ft. 0 in.	...	516	...	106	1,763	500	.....	3,058	647
14 ft. 6 in.	...	534	...	110	1,809	514	.....	3,272	710

*Spaced at 6 ft. for temperatures above 600° F. and at 12 ft. for lower temperatures.[5,6] †No downspouts but including baffles.

TABLE 2—APPROXIMATE COST OF BUBBLE TRAYS (1946), DOLLARS, EACH

Dia. (ft.)	Cast iron Fowler & Brown[1]*	Cast iron Bliss[2]†	C.I. or steel[4]‡	Steel[3]	Stainless steel[3]
2	33	...	31- 47	...	...
3	53	...	71- 106	...	...
4	88	146	125- 188	150	154
5	134	221	196- 294	220	214
6	162	335	282- 423	340	342
7	255	470	385- 585	510	505
8	323	627	502- 753	740	658
9	398	783	635- 953	810	786
10	468	934	785-1,177	930	939
11	538	...	950-1,425	1,080	...
12	...	...	1,114-1,670	1,300	...
13	...	...	1,330-2,000	1,600	...
14	...	...	1,540-2,310	2,000	...

*Converted from 1946 by a factor of 0.71. †Converted from 1947 by a factor of 1.40. ‡Based on $10-$15 per sq. ft.

TABLE 3—APPROXIMATE COSTS OF FRACTIONATOR ITEMS (1946)

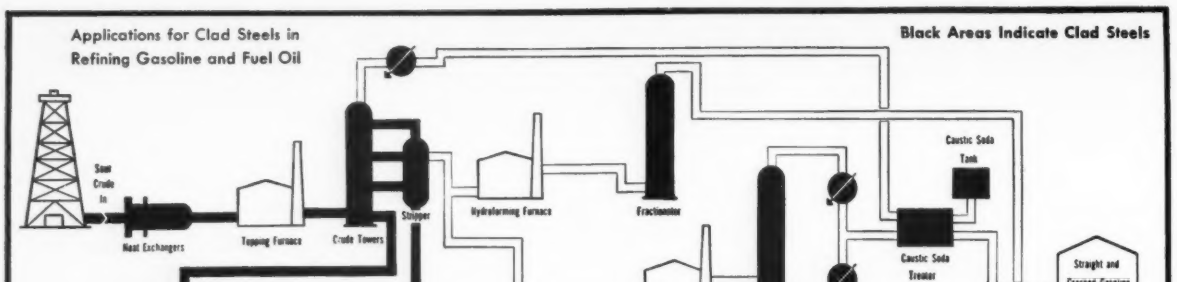
	M & L
Tray supports, steel,[3] per lb.	$0.43
Tray supports, stainless,[3] per lb.	$1.05
Trays, downspouts, reinforcing steel at top and bottom, steel,[3] per lb.	$0.30
Caps, 3-in. steel,[3] each	$0.24
Caps, 4-in. cast iron,[3] each	$0.82
Caps, 4-in. stainless, square,[3] each	*$0.86
Raschig rings, carbon[3]:	
½-in., per cu. ft.	$10.00
1¼-in., per cu. ft.	$5.00
2-in., per cu. ft.	$4.50
3-in., per cu. ft.	$3.80
Erection,[4] per cent mat.	10-30
Erection, aluminum,[3] per cent mat.	25-50
Aluminum absorber shell heads,[3] per lb.	$1.25

*Material 51 cents. By 1948 the material cost was $1.38.

References

1. Fowler & Brown, Trans. A.I.Ch.E., 39, 241 (1943).
2. Bliss, H., Chem. Engineering, May 1947, p. 126.
3. Author.
4. Happel, Aries & Borns, Chem. Engineering, Oct. 1946.
5. Hanson, L. A., Pet. Refiner, Sept. 1947, p. 112.
6. Albright, J. C., Pet. Engineer, Dec. 1947, p. 128.

No. 11 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



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PROGRESS IN METALS

by W. L. Nelson
Consulting Engineer

Stress Relieving—Large Vessels

WHILE stress relieving has been widely used for years to reduce locked-up stresses in welded structures, its use has been limited largely to smaller-sized objects that fit into conventional furnaces. However, a new method, called low-temperature stress relieving, has been developed that can be applied to large welded structures in the field. During the last 2 years it has been used on ships, and on large tanks and pressure vessels.

A paper describing the principles and practices of this stress relieving method was presented by T. W. Greene before the International Acetylene Association convention in Detroit, May 1948. The process consists of applying heat to the plate adjacent to the weld by means of a moving oxyacetylene blowpipe and then impinging a water spray on the plate approximately 6 in. behind the advancing heating flames. The temperature reached by the plate is around 350° F. as compared to 1,100° to 1,200° F. usually required in conventional stress relieving procedures.

The object of the stress-relieving operation is to expand temporarily the plate on both sides of the weld differentially in relation to the weld. This is accomplished by heating as described above. The water spray rapidly cools the plate and causes it to contract behind the heated area. This cooling permits full reduction of residual weld stresses without overheating or upsetting the heated area, and without distortion, dimensional change or imposition of residual stresses elsewhere.

An abstract from Materials & Methods of August 1948.

Book on Molybdenum

MOLYBDENUM STEELS, IRONS AND ALLOYS. By R. S. Archer, J. Z. Briggs, and C. M. Loeb, Jr., 391 pp., 188 figures, 91 tables. Published by Climax Molybdenum Co., July 1948.

THE varied applications of molybdenum and an alloying element are described in this book, which covers a wide range of materials from wrought to cast steels and from cast iron to nonferrous alloys. The major emphasis has been placed on the presentation of the fundamentals that must guide all engineers, designers, and metallurgists in their selection of the most suitable materials for a given application.

In the past, many books have been confined to the presentation of uncorrelated data on specific compositions, each of which has been treated as a self-sufficient entity. Yet, as every practical man knows, many of these are interchangeable within certain limits. In the present book, an attempt has been made to show the fields of similarity and dissimilarity of the various materials and to indicate some of the factors that may affect the choice of the most economical material for a specific part.

The scope of the book is illustrated by the main section headings: Technical Effects of Molybdenum, Fundamental Effects of Heat Treatment on Microstructure, Addition of Molybdenum, Wrought Alloy Engineering Steels, Wrought Corrosion-Resistant Steels, Wrought Steels for Elevated Temperature Service, Tool Steels, Steel Castings, Cast Iron, Special Purpose and Nonferrous Alloys.

Considerable recent information is included, not only on the more prominent developments, such as the gas-turbine steels and alloys, but also on the work that has served to clarify the factors affecting the service life of the lower alloy steels. The references to current literature are adequate to facilitate further reading by anyone who desires more detailed data.

A valuable addition is the compilation of much rather obscure, hard-to-find information on some of the specialty applications, such as exhaust valves, elevated temperature springs, ferritic gas-turbine steels, high permeability alloys, contact materials, grid wires, and prosthetic alloys. The appendices include data on standard compositions of American, British, and French engineering steels, working stresses from the boiler code, conversion tables, and the physical properties of metallic molybdenum.

The book contains descriptions of many steels and equipment applications that pertain to the petroleum industry although there are few direct references to our industry.

Forging Terms or Operations

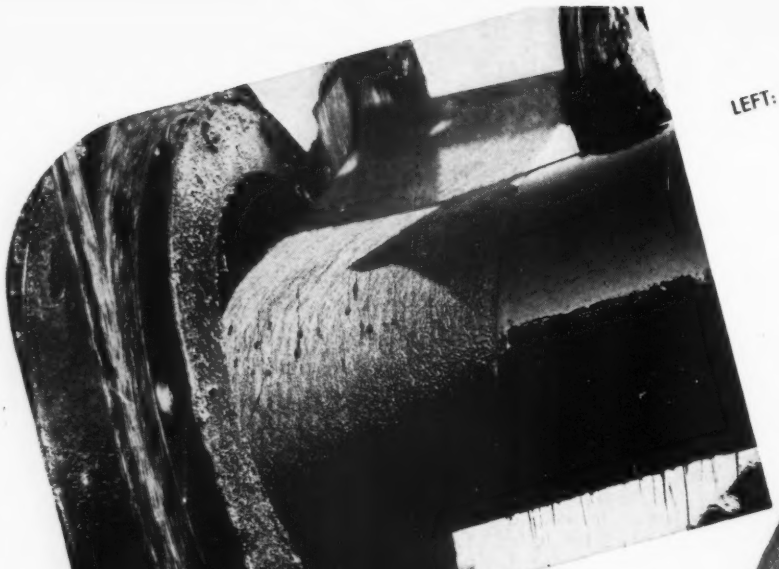
HOT CUTTING

This operation is used primarily for trimming excess metal from hot billets or other stocks so that the piece is of suitable size for further operations. Hot chisels or slicing bars mounted are employed and the work is done under a power hammer or forging press.

APPROXIMATE ACETYLENE REQUIREMENTS OF ONE BLOWPIPE*

Thickness of metal, in.	Cu. ft. of acetylene—Welding	Cu. ft. of acetylene—Cuttings
32 gage	1	
28 to 25 gage	2	
1/32 (21 gage)	4	
1/16 (16 gage)	6	3-6
3/32 (13 gage)	9	
1/8 (11 gage)	12	
3/16 (7 gage)	15	
1/4	20	
3/8	30	7-9
1/2	40	
5/8	55	12-15
3/4	70	
1	90	14-20
1 1/2	100	
2	125	16-20
3	150	19-23
(Heavy heating)	175-250	
4		21-23
5		24-29
6		27-32
8		32-39
10		37-45
12		42-52

*Linde Tips of October 1947.



LEFT: Actual field photograph at 1/250 of a second showing how rapidly Vitron glass fiber underground pipewrap is saturated by the coating permeating the jack-straw arrangement of the fibers.

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When Vitron underground pipewrap is applied with conventional coating and wrap machines, the hot coating permeates and saturates the glass fiber mat which then becomes an integral part of the coating. Every square inch of the coating throughout the circumference of the pipe is reinforced and thus improving the tensile and impact strength. The non-hygroscopic glass fibers will not absorb moisture, and being inorganic, cannot rot or decay.

Vitron is manufactured in continuous rolls of 450 feet or 800 feet with no splices or thin spots. The application method eliminates "Holidays" due to air or vapor bubbles in the coating.

Vitron is light in weight, easy to handle and apply — and economical, costing less than 1.5 cents per square foot. Standard roll widths of 4", 6", 9", 12" and 18" are available for immediate shipment from warehouse stocks. Accept no substitutes for Vitron quality.

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PIPE LINES

Stanolind to Discontinue Operation of Utah Lines

STANOLIND PIPE LINE CO. will terminate its contract effective January 1, as operating agent for Utah Oil Refining Co. crude-oil pipe lines and pump stations in Wyoming, Colorado, and Utah, according to announcements made by both companies.

The properties affected by the contract termination included about 800 miles of crude-oil pipe lines and 12 pump stations in the Rocky Mountain area. Operation of the facilities will continue under Utah Oil Refining management.

The pipe lines were built for Utah Oil Refining by Stanolind Pipe Line in 1939. Stanolind acted as construction agent but has since operated the lines. The announcement stated the agreement to terminate the contract was reached because of the added responsibilities incident to operation of Stanolind's own widely expanding properties.

J. B. Harshman, general manager of Stanolind Pipe Line Co., has resigned to become general manager of Utah Oil Refining Co. and head of the pipe-line department *(see page 140, this issue)*. Approximately 200 Stanolind Pipe Line employes engaged in the operation of the Utah facilities will be transferred to the employment of the Utah firm, according to a joint announcement by J. L. Burke, president of Stanolind Pipe Line, and E. S. Holt, president of Utah Oil Refining. All are to be transferred in their current occupations, rates of pay, and with full credit for their service with Stanolind.

Michigan Gas Seeks Change in Line Size

Michigan Gas Storage Co., Jackson, Mich., has requested Federal Power Commission authorization to substitute 113 miles of 20-in. pipe and additional compressor capacity for 113 miles of 24-in. pipe previously authorized by the commission.

Facilities originally authorized late in 1946 included 146 miles of 24-in. line in Michigan extending from Freedom Junction to the Winterfield and Cranberry Lake gas fields. Supply of natural gas is to be received from Panhandle Eastern Pipe Line Co.

Because of the inability of Michigan Gas Storage to obtain 24-in. pipe, the company postponed construction of about 113 miles of the Freedom Junction line and was authorized in 1947 to substitute for the northern 37 miles two parallel 16 and 20-in. lines.

The company stated that the 24-in. pipe is still unavailable to complete the 113 miles of construction within the required time, but arrangements have been made to obtain 20-in. pipe. The modification requested will not materially affect the original plans, the company stated.

Northwest Natural Line May Serve Pacific Coast

Northwest Natural Gas Co. is prepared to spend $100,000,000 in the construction of a pipe line and distributing system from Alberta to Vancouver, Spokane, Seattle, and other cities in the Pacific Northwest, the natural-gas commission of Canada was told recently by W. E. Simpson, of Edmonton.

The commission is investigating to find whether the export of natural gas would be fair to the people of Alberta. Other interests have proposed the construction of a pipe line costing approximately $50,000,000 from Alberta to Winnipeg.

Steel Shortage Causes Gas-Line Building Delay

Natural-gas pipe-line construction to meet the rapidly growing demands for natural gas has been delayed principally due to shortages of steel pipe, according to reports from pipe-line companies in response to a questionnaire survey of pipe-line construction progress by the Federal Power Commission.

The survey covered 83 natural-gas companies which received FPC authorization for construction and operation of new facilities between February 7, 1942, when the present certificate provisions of the Natural Gas Act became effective, and August 31, 1948. It includes 377 projects involving an aggregate estimated cost of $1,158,640,164.

Of the 377 projects covered by the survey, 288 were completed by August 31, 1948, and 89 were still under construction. Delays were reported by the companies in the case of 48 of the projects under construction.

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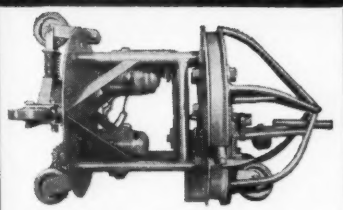
INTERNAL LINE-UP CLAMP



The electric model shown below is a rugged, heavy-duty clamp, electrically operated for the tough jobs.

ADVANTAGES:

For The Owners:
Better stringer bead; better finish weld; better pipe line.

For The Builder or Contractor:
Speed; stringer bead cut-out eliminated; economy; swabbing and alignment with one tool; less labor required.

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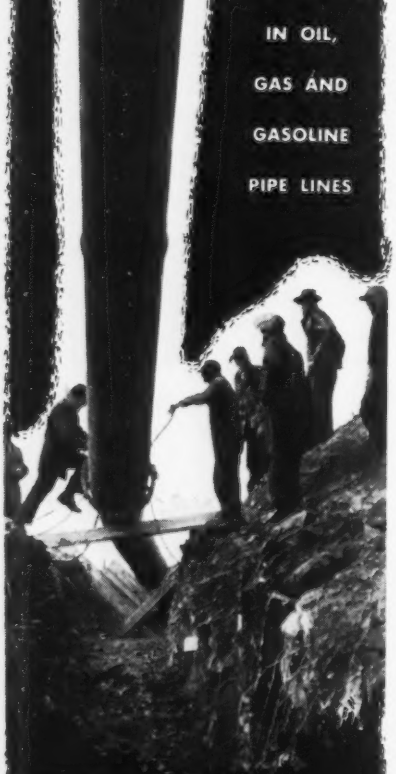

OKLAHOMA CONTRACTING CO., Inc.

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In 38 of these cases the delays were attributed to inability to obtain pipe and in the other 10 cases to a variety of reasons, principally to delay in securing compressors, machinery, and other facilities.

The survey showed that, of the 2,184,585 tons of pipe required to complete the 89 projects still under construction, 821,447 tons, or about 37 per cent had been delivered by August 31. Of the remainder, the companies estimated that nearly 238,000 tons would be delivered during the balance of 1948, about 517,000 tons in 1949, and approximately 444,000 tons in 1950. One company could not give a definite delivery date for the 80,000 tons of pipe required to complete a project, and several other companies indicated that their orders for pipe had not yet been placed and accepted.

Actual expenditures on the 377 projects to August 31 were reported by the companies to be $624,589,278 or about 53.9 per cent of the total, and estimated remaining expenditures required to complete all authorized projects were reported as $534,050,886. The companies reported $289,457,140 or 25 per cent of the expenditures to August 31 were invested in projects which had been completed by that date, while $335,132,138 represented expenditures on pipe-line projects still under construction. Total cost of the 89 projects still under construction was estimated at $869,183,024.

On October 31, 1948, 55 applications for pipe-line projects were pending on FPC's docket. Of these applications, 21 were for major projects requiring a total of approximately 2,500,000 tons of steel pipe. The report also points out that orders for additional pipe had been placed by some companies which had not yet filed applications with the commission.

Traffic and Revenue Up, Pipe-Line Companies Say

According to figures released by Interstate Commerce Commission, traffic of large oil pipe-line companies in the third quarter of 1948 exceeded the corresponding 1947 period by 6.18 per cent. The report was compiled from the statements of 44 pipe-line companies having annual operating revenues of more than $500,000.

Revenue of these carriers was up 9.9 per cent in the third quarter over the same quarter of the preceding year. Traffic amounted to 641,359,142 bbl. against 604,915,418 bbl. for the corresponding period of last year. Revenue totaled $86,397,059 against $78,643,909.

Humble Pipe Line Co. reported the largest traffic and revenue for the period. Traffic was 74,549,256 bbl. and

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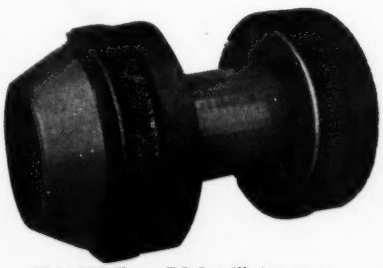
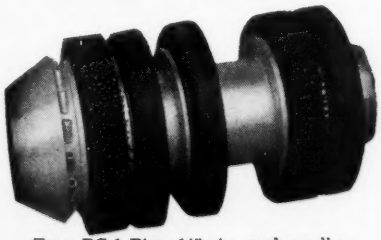
Each Pig Is Designed To Traverse Specified Valves and Fittings — SAFELY

FOR EXAMPLE:

This Type RC-1 Pig, 16" size and larger, is for the usual conditions of:
Conventional gate valves
Full diameter, 90° laterals
Field bends, min. radius 10 ft.



This 22" Type RC-5 will traverse
Through-conduit valves
Full diameter, 90° laterals
Factory ells, 1½ radius, 22½°



Type RC-1 Pigs, 14" size and smaller, must traverse
Various types of gate valves
Elongated side openings (laterals)
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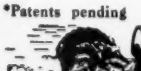

THE PIG WITH THE POKE CLEANS PIPE LINES

T. D. Williamson, Inc.
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revenue amounted to $9,367,312. Volume was up 2.2 per cent and revenue increased 4.9 per cent.

Stanolind Pipe Line Co. reported revenue of $9,255,862 on 38,012,657 bbl. Revenue was up 19 per cent, traffic increased by 14.3 per cent.

The largest volume increase on a percentage basis was reported by Project Five Pipe Line Corp. whose 4,869,251 bbl. was 37 per cent above year-earlier figures. Revenue was $385,972, up 56.1 per cent, second highest increase of the reporting carriers.

Arkansas Pipeline Corp. had a volume increase of 30.29 per cent to rank second, and led in revenue increase, up 67.5 per cent.

Volume increases were reported by 38 of the 44 reporting companies and 6 showed declines. In revenue, 35 were up for the period, while 9 reported less revenue than in the same period a year earlier.

Pacific Project Hearing Moves to San Francisco

Federal Power Commission will hold additional hearings in San Francisco starting January 31 on applications by three natural-gas companies to build 1,484 miles of pipe line at a cost of nearly $146,000,000 to carry gas from the Texas-New Mexico area into the San Francisco Bay area.

The companies involved are El Paso Natural Gas Co., San Juan Pipe Line Co., both of El Paso, Tex., and Pacific Gas & Electric Co. of San Francisco. Initial hearings were held in Washington, D. C., earlier this month and the hearing in San Francisco will be for the purpose of cross-examination. (*For details of proposed construction by the companies concerned, see The Oil and Gas Journal, November 25, page 135.*)

El Paso Natural Gas Co. has recently completed the 248-mile, 24-in. line from Eunice, N. M., to Dumas, Tex., which has been under construction this year by company crews. Gas from the Texas Panhandle is now being transmitted through the line which represents an extension of the 740-mile, 26-in. Eunice-Blythe, Calif., line built in 1947.

Swedish Engineers Study Uddevalla-Vasteras Plans

A group of Swedish engineers has been in Los Angeles in recent weeks for the study of equipment under consideration for the 220-mile products line planned by Svenska Enterprenad Aktiebolget between Uddevalla and Vasteras in southwestern Sweden. There has been no announcement as to the time when the project may be built.

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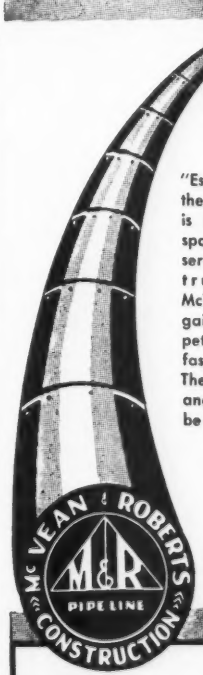

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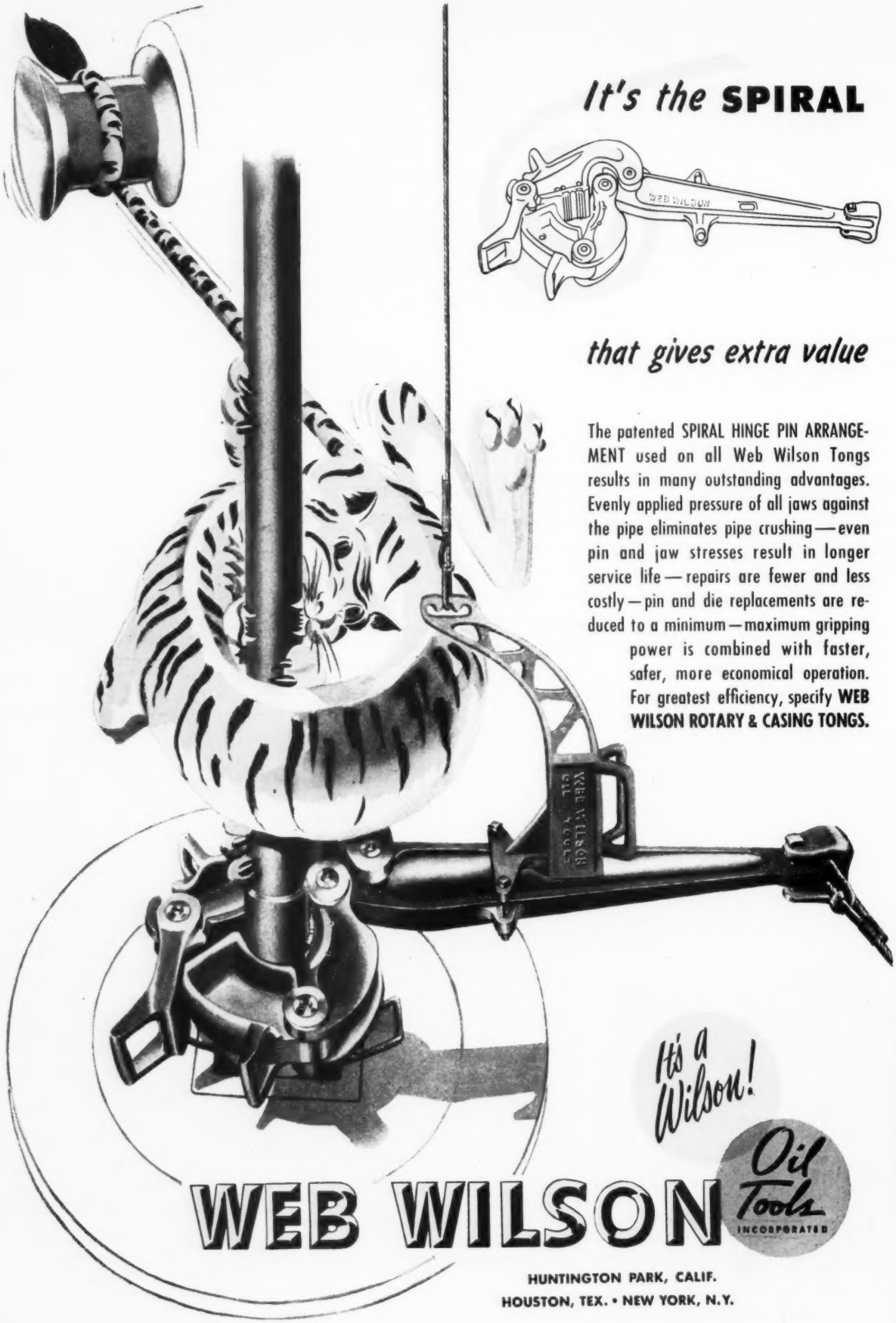

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Among the

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Number of Active Rotary Rigs Continues High Level

The high level of active rotary drilling rigs has been consistently maintained in recent weeks, running above the 2,400 level and approaching the high mark of 2,457, which was recorded November 22, 1948. Active rotary rigs for the weeks ended December 13 and December 20 follow:

	Dec. 13	Dec. 20
Pacific Coast	202	214
Oklahoma and Kansas	425	430
Rocky Mountain (including W. Canada)	232	217
Ark., La., Texas	179	179
West Tex., and N. Mex	623	603
Gulf Coast	640	636
Illinois	132	144
Total	2,433	2,423

Cheaper Drilling Sought by Drilling Research, Inc.

Research into how to make faster holes at less cost and at the same time improve drilling technique will be launched January 1 by Drilling Research, Inc., C. P. Dimit, president, Bartlesville, Okla., announced. Dr. J. V. Pennington, Houston, has been employed as technical director of the corporation and will maintain headquarters at Houston, Dimit said. Pennington will be on leave of absence from Southwest Research Institute of San Antonio and Houston, where he is associate director.

Drilling Research, Inc., is a nonprofit, cooperative research organiationz comprising 30 individuals and companies who are stockholders and licensees. Present stockholders of the corporation have subscribed $750,000 toward the program.

Devices or techniques developed by the research group that are patented will be turned over to stockholders for use without payment of royalty. Nonparticipating organizations or individuals desiring to use the patented equipment or technique will be offered licenses at nominal royalties, and this revenue will be used to further research by the corporation.

Peel Drilling Co. has contract to drill Derby Oil Co. et al 1 Behrens, SE SE NE 25-7s-19w, 7 miles northeast of the Silvers pool and 3 miles northeast of Webster in Rooks County, Kansas.

Sam K. Pack has started drilling 1 Schruben, SW SW SW 16-7s-19w, 6 miles north of the Silvers pool in Rooks County, Kansas.

Virginia Drilling Co. has set surface pipe in its 2 Wolf, SE SW SW 11-21s-12w, ½ mile north of the Saundra pool in Stafford County, Kansas.

Rowe Drilling Co. crew on Chapman McFarlin 14-C Wilson, Holliday, Tex. Shown here are H. C. Colbert, driller, R. G. Patrick, A. C. Huskey, and D. M. Hourn

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Skid Length	8'	6'
Weight	1100 lbs.	525 lbs.

Built of heavy gauge sheet metal . . . heavily braced at all edges and corners . . . cover fitted with piano-type hinge and steel handle with hasp for padlock . . . in open position lid held by safety catch . . . mounted on sturdy skids.

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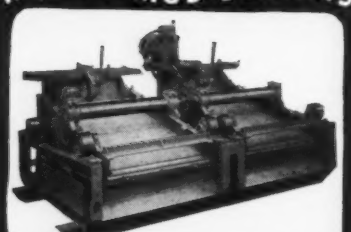

OVERSTROM'S 2'x 4' and 3'x 4' dual and single unit mud screens, mainly used for shallow and medium drilling operations, have earned and won the acceptance of drilling operators throughout the world. The proven product of 25 years experience in designing vibrating screen equipment.

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Brehm Drilling & Producing Co., Mount Vernon, Ill.

History.—In 1941, C. E. Brehm organized Brehm company, and for the first year devoted most of his time to contract drilling. Since that time, however, about one-half of the emphasis has been placed on drilling wells on company-owned properties. Tools of this company drilled the discovery well in the Omaha pool of Indiana in 1947, a well in which the Farm Bureau of Indiana owns one-half interest. The Concord pool, T6s-R10e, White County, Illinois, was also opened by Brehm Drilling & Producing Co. The company, in addition to its drilling operations, now has 85 of its own producing wells.

Operations.—Several leases are being actively developed at this time, with two wildcats scheduled soon. Two rigs are under contract to producing companies, Sohio Petroleum Co. in Gallatin County, and Magnolia in Wayne County, Illinois. Development operations are also being carried on in the Omaha pool. Southern Illinois, southwestern Indiana, and western Kentucky are the scene of the company's drilling operations. One 5,000-ft. rotary unit, a 4,000-ft. Tulsa unit, and two spudders comprise the list of company drilling tools.

Personnel.—The company is owned by C. E. Brehm, with Bill McKay as production superintendent. L. L. "Pete" Hall is drilling superintendent, J. Curtis Statt is landman, and Mart Tinney is pusher.

J. C. Hawkins has contract to drill Atlantic Refining Co. 2 Gas Unit 3, in North Tepetate field, Acadia Parish, Louisiana, to a depth of 8,200 ft.

Circle Drilling Co. will drill Roeser & Pendleton, Inc., et al 3 Columbia Land & Timber Co., South Bancroft field, Beauregard Parish, Louisiana, to the Wilcox zone.

Hillburn Drilling Co. has contract to drill two wells in Plaquemines Parish, Louisiana. Superior Oil Co. 2 Orleans Levee district, Potash dome, is to be drilled to 11,000 ft. Tide Water Associated Oil Co. 21 Manhattan Land & Fruit Co., Venice pool, will be drilled to 8,700 ft.

Long Brothers has contract to drill John F. Camp. & Sons E-4 James F. Welder heirs, a wildcat test 1½ miles southwest of Squire field, in northeastern Duval County, Texas, in V. Garza Survey 8. Contract depth is 3,500 ft.

Can-Tex Drilling Co. will drill Imperial-Woodbend 15, LSD 1, 17-51-26w4, ½ mile west of Imperial 11, first producer from the D-2 zone. Can-Tex will also drill Imperial-Woodbend 16, LSD 3, 21-51-26w4, ½ mile west of Imperial 12 and ½ mile north of Imperial 10.

E. H. Adair is drilling below surface pipe at his 1 Wolf, NE NE NW 3-21s-12w, in Stafford County, Kansas.

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DRILL COLLAR CLAMP

A safety device as well as a universal set of slips. No drill collar slips needed if used with heavy plate atop the master bushing. Movable slip inserts with VARCO buttons, complete within itself; no extra parts needed. For drill collar sizes 4½" to 8" inc. Chrome alloy heat treated steel. Write for complete data.

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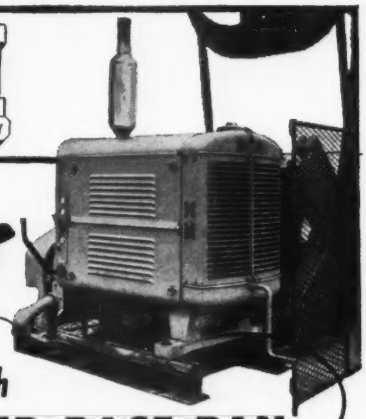

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Built for Oil Field Service
Tighten without dis-engaging hooks
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Typical of Western field installations is the Telescopic Jacket Water Cooler, left, at Phillips Petroleum Products pump station, Cassaday, Kansas; and, right, Floating Head Gas Coolers at Panhandle Eastern Pipe Lines Liberal, Kansas, station.

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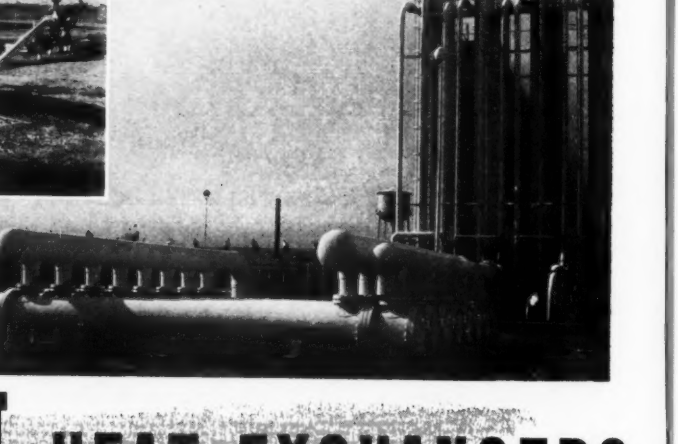
Pipeline companies throughout the oil industry, like refiners, manufacturers and processors, look to Western for an efficient, economical solution to their heat transfer problems.

Our Engineering Department is at your disposal for consultation on the application of specific heat transfer requirements to your particular need.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REFINING

Philadelphia to Become Important Refining Area

According to a survey made by the Philadelphia Chamber of Commerce, that city will become the nation's second largest petroleum refining center upon the completion of $163,000,000 in refinery projects earmarked for the area by major oil companies.

Philadelphia will be surpassed only by the Houston-Beaumont, Tex., area. The Chamber of Commerce also said this will be the largest amount to be spent in the Philadelphia area by any industry since the war.

The Texas Co.'s refinery at Westville, N. J., the biggest plant scheduled for the area, will cost about $50,000,000. The first unit of this plant will be in operation by mid-1949.

Gulf Oil Corp. has announced plans to enlarge its refinery's capacity from 77,000 bbl. to 107,000 bbl. daily. Gulf's eventual outlay on these facilities, expanding to process Kuwait oil, may exceed $100,000,000.

Sun Oil Co., which now operates the largest refinery in the area, plans to spend another $20,000,000. The company's Marcus Hook refinery has a capacity of 140,000 bbl. of crude daily. A dewaxing unit with a potential of 150 tons of wax was added this year, while a packaging unit now under construction will be able to seal 300 qt. of oil a minute in 1-qt. cans.

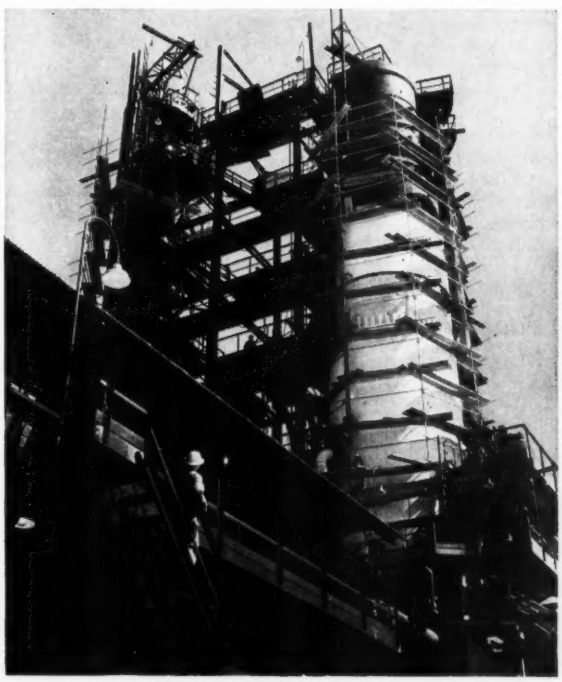
Atlantic Refining Co.'s plant, the second largest in the Philadelphia area, also plans to spend $20,000,000 in 1949. Its present refining capacity is 120,000 bbl. a day. Socony-Vacuum Oil Co., Inc., has earmarked expenditures of $18,000,000 for the area and Sinclair will spend $15,000,000.

Second Plant Sold by Carter in Recent Weeks

Cooperative Refinery Association, Kansas City, Mo., has purchased the Carter Oil Co. 2,000-bbl. refinery at Newcastle, Wyo. The transaction marks the second sale of a Carter refinery in Wyoming in recent weeks. Last month Husky Refining Co. bought the 2,000-bbl. Lovell, Wyo., refinery from Carter.

Sale of the Newcastle refinery, the price of which was not disclosed, included the tank farm and nearly 50 acres of land. Thirty-three former Carter employes will be offered jobs with the co-op, according to Howard A. Cowden, president and general manager. Operation of the refinery by the co-op will be taken over December 31.

Commenting on the sale recently of the Lovell plant, Carter officials stat-



An insulating jacket of 2½-in. thick asbestos slabs is being fitted to the new atmospheric topping tower at the Gulf Oil Corp. refinery at Port Arthur, Tex. Covering is strapped and wired in place, sealed with asbestos cement, and finally painted with black corrosion resistant paint. The tower is a part of Gulf's $19,000,000 major expansion recently completed at the Port Arthur refinery. (See The Oil and Gas Journal, December 16, 1948, page 128)

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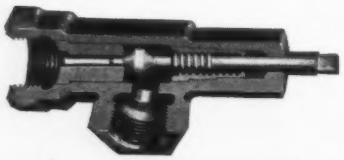

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ed that the company disposed of the plant because other Carter refineries could supply sufficient products to care for the company's demand during the coming winter, and that their new 20,000-bbl. plant now under construction at Billings, Mont., would be completed in time to meet the heavier requirements in 1949.

Educators Get Practical Course on Diesel Fuels

As part of a long range educational program sponsored by the Diesel Engine Manufacturing Association, instructors in mechanical engineering attended an all-day meeting recently at Shell Oil Co.'s Wood River, Ill., research laboratory.

The meeting was one of a series conducted by D.E.M.A. to permit mechanical engineering instructors to see first-hand, the process by which diesel oils are produced and to enable them to hear lectures by oil men on the latest manufacturing processes and research aims.

During the morning a round-table discussion of test techniques provided an opportunity for an exchange of information on new methods of testing and new developments in instrumentation. Instructors were shown the test methods used by Shell to evaluate fuel and lubricants and the amount and type of instrumentation considered necessary in an industrial laboratory.

During the afternoon another discussion period dealt with manner in which research problems originating either in the field or in the laboratory, help industrial engineers to anticipate future requirements. Instructors were shown how these problems are brought into the laboratory, subjected to extensive investigation, and taken out into the field for trials before the problems are considered solved.

Also included in the day's program was an inspection of the engine and chemical sections of the laboratories, an inspection of the plant's asphalt and gas-turbine laboratories, and discussions of how universities can best prepare men to meet the demands of industrial research and how industry can help colleges with this problem.

Panoma Plant Will Start Marketing Products Soon

Three grades of motor fuel from a new $3,000,000 extraction plant 3½ miles southwest of Hooker, in Texas County, Oklahoma, will be placed on the market early next year by Panoma Corp., of Amarillo, Tex.

All products will be derived from natural gas from Panoma wells in Texas County in the Oklahoma Panhandle near the center of the Hugoton gas field. After processing, the dry gas will be piped to a new booster station operated by Natural Gas Pipe Line Co. of America which services the Chicago area.

The Panoma plant, which was completed last month, markets several products including propane, butane, isopentane and normal pentane.

Influenza Cases at Gulf Refinery Cut by One-Third

Influenza cases at Gulf Oil Corp.'s refinery at Port Arthur, Tex., were reduced by one-third in the 1948 "flu" period, due to a test program of influenza inoculations. Injections were taken voluntarily by 68 per cent of the workers.

Results of the program follow: Number of cases in January through May 1948 was 139 compared to 262 for the same period in 1947. Number of scheduled working days lost because of influenza was 1,590 in January through May 1948, as against 2,528 for the same period of the previous year. The frequency rate per 1,000 employes for the test period was 21.47 in the vaccinated group and 33.75 in the unvaccinated group.

Modernization Program Set For Coffeyville Refinery

A $900,000 modernization and activation program by Consumers Cooperative Association at its Coffeyville, Kans., refinery is scheduled to begin next month, it was announced by Howard A. Cowden of Kansas City, president of Consumers.

The project to modernize and activate the high-octane gasoline units will increase the refinery's crude-oil capacity from the present 13,500-bbl. daily to 20,000 bbl. The co-op's investment at the Coffeyville refinery will be increased to $8,500,000 by the new project, Cowden reported.

Sun Gets Reserve Units

Two more Army Reserve units were activated recently at the Marcus Hook, Pa., refinery of Sun Oil Co., making a total of three units now under Sun sponsorship. Under the program, members of the reserve components meet twice a month for specialized training which will enable them to move into the field as a unit in the event of war.

Cold-Weather Oil Developed

MacMillan Petroleum Corp. has announced the development of an automobile motor oil capable of remaining fluid in temperatures down to 60° F. below zero. The new lubricant is fortified against oxidation, foaming, and varnish while retaining film strength and penetrating qualities. The company's tests showed little ring or bearing wear, very little carbon sludge, and normal oil consumption.

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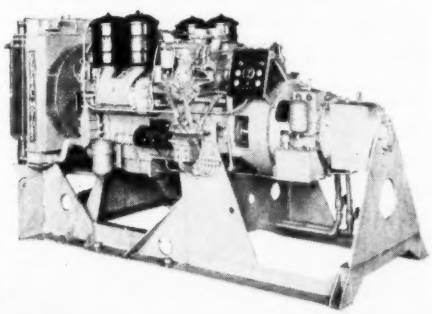

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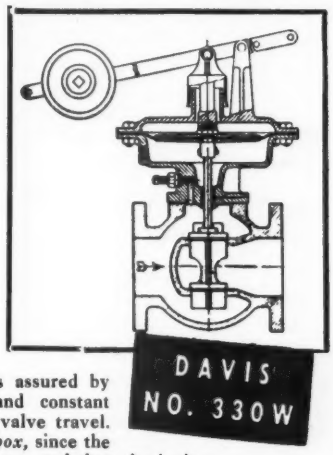

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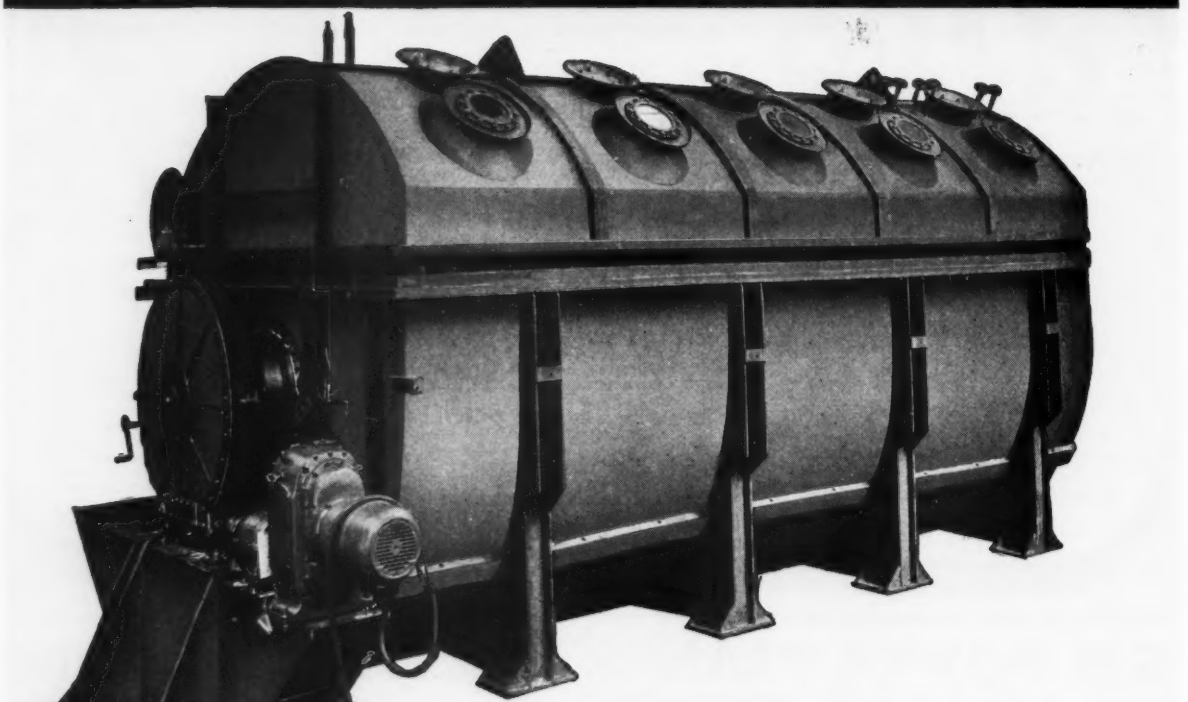

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NATURAL GAS

Rates of United Natural Are to Be Investigated

An investigation of the rates charged by United Natural Gas Co. of Oil City, Pa., has been ordered by the Federal Power Commission. The commission said that on the basis of available data and on the advise of the New York State Public Service Commission, the company's rates and charges "may be unjust, unreasonable, unduly discriminatory or preferential."

FPC was advised by the New York commission that Iroquois Gas Corp. of Buffalo, N. Y., which receives more than 80 per cent of its gas from United Natural, proposes to increase its rates. The state group has asked FPC "to institute such action as may be necessary to fix just and reasonable rates for the gas supplied by United Natural to Iroquois."

FPC Releases Report On Natural-Gas Study

WASHINGTON. — Reports of the Federal Power Commission on its investigation of natural gas (Docket No. G-580), which were released in sections early this year, have now been printed in 2 volumes by the Government Printing Office and are available at $1.90 for the set.

The major report was signed by Chairman Nelson Lee Smith and Vice Chairman Harrington Wimberly, and dissenting views were written by Commissioners Leland Olds and Claude L. Draper. No majority report was possible because of a vacancy on the commission, since filled by the appointment of Thomas C. Buchanan of Pennsylvania.

Gas Companies Are Denied Rehearing on Tariff Order

Applications of 13 natural-gas companies seeking a rehearing on the Federal Power Commission's order of October 30, 1948, which amended general rules governing the filing of tariffs of natural-gas companies subject to the commission's jurisdiction, have been denied. *(See The Oil and Gas Journal for rule changes, November 11, page 398.)*

In denying the application FPC reported that in general the points urged in the applications had been previously presented and "may be fairly said to have been considered by the commission prior to the issuance" of the order.

However, to clarify one section of the amended regulations over which an "apparent misunderstanding" has arisen, FPC pointed out that Section 154.85 expresses "the commission's intention to permit contracts now on file as effective rate schedules to continue in effect . . . until they expire or are superseded." FPC added that, "the regulation neither requires that existing contracts remain in effect nor that they be changed. It is permissive only."

A.G.A. Offers Corrosion Patent for General Use

American Gas Association, Inc., has secured a patent for an invention relating to methods and apparatus for measuring the corrosion characteristics of soil in situ. The patent, referred to as soil Redox probe, is a direct result of the research activities of the corrosion research fellowship and the work of the corrosion research associate, being supervised by the technical section's subcommittee on pipe coatings and corrosion.

Investigations were initiated at Rutgers University in 1941 under the direction of Dr. Robert L. Starkey and later Kent M. Wight contributed to the work. Numerous interim reports relating to the progress of these research investigations in microbiological araerobic corrosion were made to the membership of the A.G.A.

Following graduation of Dr. Wight, the data resulting from his research were consolidated and compiled into one final report entitled, "Anaerobic Corrosion of Iron in Soil" which relates to the development, use and interpretation of results obtained with the soil Redox probe.

Although additional field measurements are required to establish more precisely the exact correlation which exists between Redox potential and the severity of corrosion of subsurface ferrous structures, the initial field investigations of Starkey and Wight were extremely encouraging, indicating the suitability and reliability of the soil Redox probe in future determinations of corrosive soil areas, even prior to the construction of pipe lines through such soils.

A.G.A. has dedicated the patent to the free use of the industry, the public, and all those interested in the mitigation of underground soil corrosion.

Ransom Gives Testimony On Hugoton Gas Rates

As the Kansas Corporation Commission reopened a hearing on an application that it set a minimum of higher Hugoton field well-head rates, it heard testimony from Raymond Ransom, Washington consulting engineer, that Panhandle Eastern Pipe Line Co. was being allowed a return of 6.38 cents per thousand cubic feet for natural gas produced by its own wells in Hugoton field, Kansas.

Ransom told the commission that the figure was one calculated from the 6 per cent return upon investment approved for Panhandle Eastern by the Federal Power Commission. Average well-head price of Hugoton gas is slightly over 5 cents per thousand cubic feet.

In crossexamination by an attorney representing Panhandle Eastern, Ransom admitted he did not recompute his figures for Texas after a September proration order by the Texas Railroad Commission, affecting sour-gas production in the Texas Panhandle area.

New York Natural Fails To Gain FPC Hearing

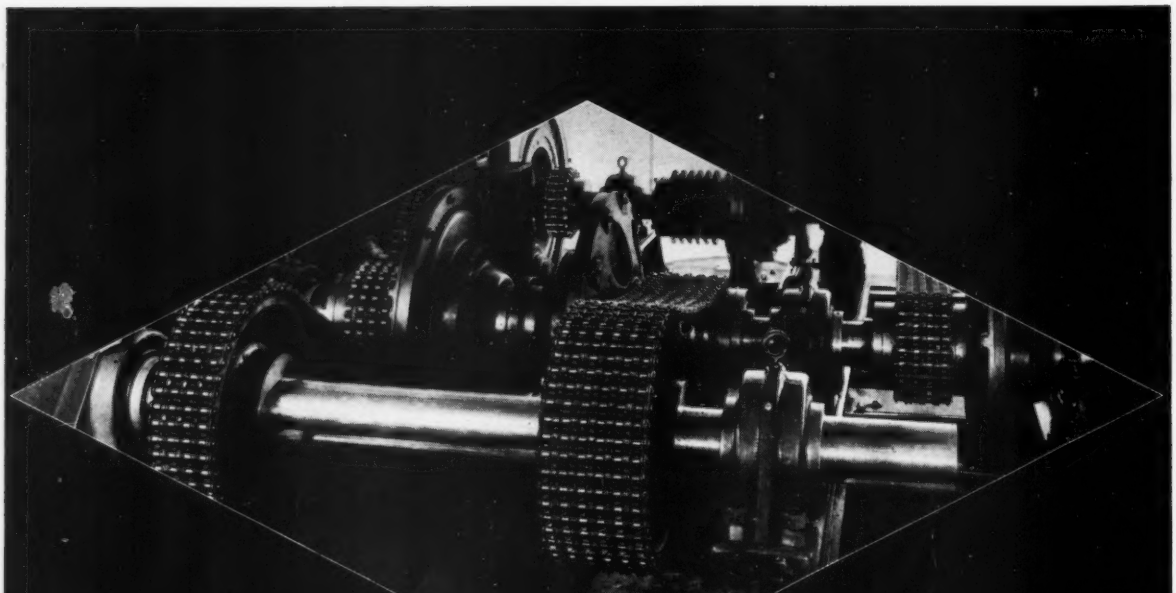
Federal Power Commission has denied an application for rehearing sought by New York State Natural Gas Corp. for rehearing on FPC's order of November 3, 1948, which authorized the company to acquire, construct and operate natural-gas facilities.

The company, in its application for rehearing, objected to the portion of the order relating to recording in its accounts of the acquisition of a 10-mile pipe line from Empire Gas & Fuel Co. of Wellsville, N. Y. FPC's order directed New York State Natural to record the $75,000 cost of the line in accordance with instructions of the commission's accounting system prescribed for natural-gas companies dealing with the recording of acquisitions.

In its order denying rehearing, FPC said that the record "fully supports and warrants the finding and conclusion that the proposed acquisition is that of an operating unit or system" within the meaning of the instructions.

Shamrock to Purchase Panhandle's Production

Production from the natural-gasoline plant of Panhandle Eastern Pipe Line Co. northeast of Liberal, Kans., will be purchased by Shamrock Oil & Gas Co. of Amarillo, Tex., which has started construction of a blending, loading and marketing plant located between the Panhandle plant and the Cimarron River.



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REPORTS ON

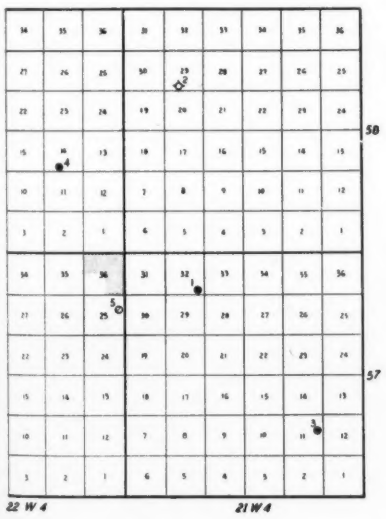
Exploration and Drilling

Canada's Redwater Field Proven For 9-Mile Length

REDWATER field in Alberta, Canada, is now proven for production for a length of 9 miles along the axis of the structure. This feat has been accomplished by drilling only four wells, of which only one was dry. The latest success is Imperial Oil Co., Ltd., 3 Redwater, LSD 9, 11-57-21w4, which extends the field 3 miles southeast from the discovery. It had already been extended 4 miles northwest by the second oil well.

Imperial's No. 3 topped the reef zone of the Devonian lime around 3,155 ft., and on the basis of the discovery well, this indicates there ought to be about 120 ft. of oil pay above the water line. Two drill-stem tests have been run. The first, bottomed at 3,160 ft., probably took in only 5 ft. of pay section, but is brought a 300-ft. rise of oil in 1 hour. The second test was bottomed at 3,205 ft., taking in probably 50 ft. of pay zone. There was a flow of oil to the surface in 50 minutes, and then the well was allowed to flow freely for 5 minutes before being closed in.

Of the three producers brought in so far, the discovery is the highest and has about 145 ft. of pay zone above the water line. The northwest well (see map) is the lowest, and had about 80 ft. of pay above the water line. The southeast well, as mentioned above, looks like it ought to run about 120 ft. of pay above the water-oil contact.



The effect of these new developments will certainly not be in the direction of slowing down the exploratory play that has engulfed practically all of Alberta. Practically every major United States operator and many independents are getting into this play in a big way.

On the other hand, even if Canada lives up to its present promise (and there is hardly a doubt that it will), there are major problems lying ahead for an interim period. Canada can use considerable Canadian production—when the crude is made available to the consuming markets. But until steel can be obtained and major pipe-line projects built eastward, and probably also westward, some stiff proration problems lie ahead.

Considering all the problems of foreign exchange these days, the Canadian Government would probably favor curtailing oil imports almost completely, if Canadian oil were available. That means that production can be increased by nearly a quarter of a million barrels daily over the present levels, before Canada is self-sufficient.

But before that day can arrive, steel and pump-station equipment must be obtained to build practically transcontinental pipe lines to the large eastern consuming areas.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

WEST TEXAS.—Gaines County had its first Ellenburger prospect at Shell Oil Co., Inc., 1 Hawkins, some 15 miles south and slightly west of Seminole. On a drill-stem test in the top of the formation it filled the hole with 11,000 ft., or nearly 150 bbl. of 36°-gravity oil, with no water. The well did not flow on the test, but unloaded oil with every stand.

NORTH TEXAS.—Jack County's first Ellenburger well flowed distillate at the rate of 425 bbl. a day, to fill all available storage. The new strike is Sorrells Oil Co. 1 Campsey, 9 miles east of Antelope. Continental's discovery southeast of Bowie in Montague County, had flush production in the Bend conglomerate.

SOUTHWEST TEXAS.—First oil well for the Palo Blanco dome of Brooks County has been found in George H. Echols 1 Mrs. Donald Alexander, which is flowing into tanks from an oil sand at 3,603-14 ft. On drill-stem test from 3,609-14 ft., using ¼-in. chokes, recovered 450 ft. of pipe line oil. Total depth is 3,614 ft.

SOUTH LOUISIANA.—Potential gage for Shell Oil Co., Inc., A-1 J. A. Smith, deepest oil producer, at Week's Island, Iberia Parish, flowed 420 bbl. of 33°-gravity oil per day through a 12/64-in. choke, from perforations at 14,243-55 ft. On test through perforations at 14,904-14 ft., it flowed at the rate of 672 bbl. of oil per day through a ¼-in. choke along with 10,000,000 cu. ft. of gas daily.

ROCKY MOUNTAIN AREA.—Seaboard and Husky found oil in the Tensleep at their wildcat in the Little Sand Draw area, between Gebo and Golden Eagle fields in Hot Springs County, Wyoming, and the operator is now running casing for completion. The well made 1,170 ft. of clean oil in 1 hour between 6,075-95 ft. At the first Beaver Creek field deep test Stanolind's 11 Unit flowed at the rate of 8 bbl. of 42°-gravity oil for a discovery in the Tensleep formation. A new discovery 3 miles southwest of the Mush Creek field has been made by Morton Oil Co. Oil is also reported in a wildcat 20 miles northwest of Mush Creek at Esperado Mining Co.'s Northwest Lodgepole wildcat.

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OKLAHOMA

Misener Sand Pay Added In Southeast Polo Pool

PHILLIPS PETROLEUM CO. has added Misener sand production in the Southeast Polo pool, Noble County, at 2 Dayton, NE SE SW 2-21n-2w. The well was drilled to 5,136 ft. and casing set at 5,120 ft. Perforations were made at 4,994-99 ft. and the well flowed 180 bbl. in 15 hours. The major part of production in the pool is from the second Wilcox.

Amerada Petroleum Corp. is adding a producer in Southwest Alabama pool at 1 Fulks, NW NW NW 6-9n-11e, Hughes County. The well flowed 256 bbl. of oil and 500,000 cu. ft. of gas in 24 hours. The Cromwell was called at 3,008 ft. and casing set at 2,990 ft. The Fulks well is southeast of the pool opener, Frank B. Murta 1 Ida Ellis, SE NW SE 6-9n-11e, that was completed early in September.

Ideal Cement Co. and C. W. Roodhouse 1 Riddle, C W½ SW NE 27-2n-9e, Coal County, may revive interest in the Centrahoma pool area. The well made 24,000,000 cu. ft. of gas with an estimated 25 bbl. of distillate in 24 hours from the Cromwell, topped at 5,200 ft. Other production in the pool is from the Viola.

In Carter County, Continental Oil Co. 1 Head, SE SE SE 6-4n-2w, flowed 20 bbl. of oil in 7 hours through 10/64-in. choke from a plugged-back depth of 2,971 ft. This discovery well is east of Healdton field and northeast of Hewitt field.

C. E. Waite and G. F. Martin 1 Masingale, NE NW NE 3-20n-11e, is a prospective pool opener for Osage County. Operators tested the Hominy sand at 2,274-87 ft., and had a fillup of 1,500 ft. of oil in 24 hours. The well is north of the Page district and east of Pioneer field.

Stanolind Oil & Gas Co. has a gas-distillate show at 1 State Tract 25, NE SW SW 36-9n-17w, about 5 miles southeast of Cordell in Washita County. A 2-hour drill-stem test of granite was at 7,570-7,662 ft. had gas in 4 minutes, estimated at 2,000,000 cu. ft. per day. Recovery was 195 ft. of distillate and 125 ft. of distillate-cut mud.

OKLAHOMA SUCCESSFUL WILDCATS

Beckham County: Union 1 Music, N/2 SE NW 25-10n-21w, flowed 237 bbl. 63°-gravity distillate a 9,649-62 ft., TD 9,708 ft.

Jefferson County: Amerada 1 Edwards, NW SE SE 4-4s-4w, pumped 213 bbl. of 34°-gravity oil per day from sand at 2,724-79 ft., TD 3,152 ft.

Kingfisher County: Superior 1 Long, SE SE SE 16-17n-7w, 43 bbl. of oil in 15 hours from dolomite at 8,565-8,640 ft., TD 9,026 ft.

McClain County: Danciger 1 De Cordove, NW SE SW 35-8n-3w, flowed 515 bbl. of 65°-gravity distillate from first Bromide sand at 9,373-76 ft., TD 9,382 ft.

Sinclair 1 Dennis, C SE NW 13-9n-4w, flowed 238 bbl. of 39°-gravity oil per day from Hunton at 8,601-50 ft., TD 8,956 ft.

Oklahoma County: Jordan 1 Barry, NW NW SE 35-13n-1e, pumped 80 bbl. of oil per day from Misener at 5,558-66 ft., TD 5,568 ft.

OKLAHOMA WILDCAT FAILURES

Blaine County: Placid 1 Winter, C SW SE 18-19n-11w, dry, TD 9,097 ft., Pawhuska 4,280 ft., Avant 5,480 ft., Layton 6,455 ft., Checkerboard 6,640 ft., Big lime 6,895 ft., Oswego 7,050 ft., Maramec 8,435 ft., Woodford 8,998 ft., Hunton 9,040 ft.

Cleveland County: Mee 1 Wilson, C NE NW 12-9n-1e, dry, TD 6,210 ft., Pawhuska 2,315 ft., Avant 3,640 ft., Belle City 3,715 ft., Hogshooter 4,165 ft., conglomerate 4,608 ft., Oswego 5,160 ft., Bartlesville 5,420 ft., unconformity 5,504 ft., basal Pennsylvanian-Hunton-Bois d'Arc 5,554 ft., Chimney Hill 5,770 ft., Sylvan 5,838

ft., Viola 5,936 ft., dolomite 6,007 ft., sandy dolomite 6,174 ft., second Wilcox 6,191 ft.

Creek County: Westcott 1 Landrum, NW SW NE 29-19n-7e, dry, TD 3,005 ft., Hogshooter 1,690 ft., Layton 1,713 ft., Checkerboard 2,020 ft., Oswego 2,435 ft., Verdigris 2,575 ft., upper Skinner 2,595 ft., lower Skinner 2,680 ft.

Kiowa County: Kerr 1 Hobart, NE SE SE 13-7n-17w, dry, TD 2,502 ft.

Edgerton 1 Sexton, SE SW SE 13-17n-21w, dry, TD 1,735 ft.

Lincoln County: Berry 1 McFarland, SW SW NE 18-13n-4e, dry, TD 3,394 ft.

Logan County: Grayhill 1 Canada, SW NE SE 9-15n-1e, dry, TD 5,651 ft., Big lime 4,580 ft., Oswego 4,660 ft., Mississippi lime 5,078 ft., Woodford 5,166 ft., Hunton 5,231 ft., Sylvan 5,353 ft., Viola 5,463 ft., Wilcox 5,546 ft., second Wilcox 5,634 ft.

McClain County: Plymouth 1 Ttate, NE NE NE 27-5n-1w, dry, TD 7,223 ft.

Noble County: H. E. R. Dolezal, NW SW SE 11-20n-1w, dry, TD 5,047 ft., Peru 4,470-81 ft.

Francis 1 Vanselous, NE NW NE 10-24n-1e, dry, TD 4,730 ft., Tonkawa lime 2,453 ft., Tonkawa sand 2,550 ft., Avant 2,845 ft., Layton 3,345 ft., Checkerboard 3,548 ft., Big lime 3,728 ft., Oswego 3,774 ft., Skinner 3,998 ft., chat 4,263 ft., Mississippi lime 4,312 ft., Woodford 4,603 ft., Viola 4,638 ft., dense 4,644 ft., dolomite 4,653 ft., Wilcox 4,678 ft., second Wilcox 4,710 ft.

Okfuskee County: Mid-Continent 1 Weimer, C SE NE 7-13n-8e, dry, TD 4,217 ft., Oswego 2,488 ft., Prue 2,503 ft., Verdigris 2,615 ft., upper Skinner 2,685 ft., lower Skinner 2,700 ft., Red Fork 2,865 ft., Inola 3,085 ft., Bartlesville 3,095 ft., first Booch 3,260 ft., second Booch 3,290 ft., upper Dutcher 3,492 ft., lower Dutcher 3,533 ft., Woodford 3,980 ft., Viola 4,127 ft., dense 4,154 ft., dolomite 4,158 ft., Wilcox 4,175 ft., second Wilcox 4,198 ft.

Payne County: Woods 1 Brink, NE NW NW 8-18n-5e, dry, TD 3,504 ft., Checkerboard 2,505 ft., Peru 2,803 ft., Oswego 2,892 ft., Prue 2,999 ft., Skinner 3,055 ft., no Bartlesville, Mississippi lime 3,480 ft.

Pottawatomie County: Texas 1 State School Land, SW SW NE 36-9n-3e, dry, TD 5,460 ft., Pawhuska 1,530 ft., Belle City 2,615 ft., Hogshooter 2,985 ft., Checkerboard 3,345 ft., Mayes 4,670 ft., Woodford 4,810 ft., Hunton 4,883 ft., Sylvan 5,050 ft., Viola 5,150 ft., dolomite 5,255 ft., first Wilcox 5,305 ft., sandy dolomite 5,385 ft., second Wilcox 5,425 ft.

Wegener 1 Reasor, NE NE NE 13-10n-3e, dry, TD 5,441 ft.

KANSAS

Two Discovery Wells For Rooks County

HEATHMAN-HONAKER DRILLING CO. has a prospective pool opener at 1 Hayden, NE NE SE 31-8s-19w, Rooks County, about 1½ miles west of West Barry pool. The well swabbed 1 bbl. of oil per hour natural and after treatment with 1,000 gal. of acid swabbed at the rate of slightly more than 100 bbl. per day. After an additional acid treatment, the well swabbed at the rate of 120 bbl. per day through perforations at 3,513-16 ft., opposite the Arbuckle.

In the next township to the north, Sam K. Pack has set casing at 1 Griebel, NE NE NW 8-7s-19w, for a test of the Arbuckle topped at 3,438 ft. The hole was drilled to 3,456 ft. and casing set at 3,446 ft.

Ben F. Brack has completed 1 Wright, NE NE SW 32-20s-13w, on the southern border of Barton County with a potential of 190 bbl. per day from the Arbuckle. The Arbuckle top was called at 3,545 ft. and hole was carried to 3,561 ft. The new pool opener is 1 mile southeast of Hiss pool.

In the area east of Burrton pool in Harvey County, Westgate-Greenland Oil Co. and Mallard Drilling Co. have a show in the Mississippian at 1 Howard, SE SW NW 15-23s-3w. The Mississippian was topped at 3,252 ft. and a drill-stem test at 3,260-3,350 ft. had gas in 3 minutes estimated at 3,000,000 cu. ft. per day. Recovery was 60 ft. of oil-cut mud. Casing has been set to 3,350 ft.

Riverview pool in Ellis County has two good wells completed on the east side of the pool. Gulf Oil Corp. 1 Truan, NE NE NW 28-11s-18w, was completed in the Arbuckle with a depthograph potential of 2,373 bbl. per day. Sinclair Prairie Oil Co. 1 Fisher, NE NE SE of the same section, rated 1,858 bbl. per day.

Sinclair Prairie Oil Co. has another maximum well in De Geer pool of Barber County. The well, 1-C V. De Geer, SE SE NE 3-33s-15w, had the Viola at 5,233 ft. and made the maximum bomb potential rating through perforations at 5,256-62 ft.

Derby Oil Co. and Peel Drilling Co. have an Arbuckle pool opener at 1 Lewis, NE NE NW 23-10s-21w, Graham County. The well swabbed 29 bbl. of oil in 5 hours from the Arbuckle, topped at 3,777 ft.

For the week, a total of 65 new locations were announced with Butler and Rooks counties leading for 10 spots each.

KANSAS SUCCESSFUL WILDCAT

Rooks County: W. L. Hartman 1 Westhusin, SW SW SW 31-9s-17w, pumped 12 bbl. of oil per day from Lansing at 3,477-88 ft.; Topeka 3,045 ft., Heebner 3,265 ft., Dodge 3,283 ft., Simpson shale 3,581 ft., Simpson dolomite 3,583 ft., Arbuckle 3,613 ft., TD 3,615 ft.

KANSAS WILDCAT FAILURES

Barton County: Continental Oil Co. 1 Riedel "B," NE NW SE 4-18s-15w, dry, TD 3,613 ft., anhydrite 1,007 ft., Lansing 3,309 ft., Arbuckle 3,583 ft.

Ellis County: Derby Oil Co. et al 1 Herl,

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NE SW SW 13-14s-18w, dry, TD 3,610 ft., Heebner 3,208 ft., Lansing 3,259 ft., conglomerate 3,524 ft., Arbuckle 3,560 ft.

Brunson et al 1 Braun, NW NW SE 35-12s-17w, dry, TD 3,673 ft., anhydrite 1,260 ft., Kansas City 3,365 ft., conglomerate 3,607 ft., Simpson 3,619 ft., Arbuckle 3,623 ft.

Westgate-Greenland Oil Co. 1 McConchie et al, NW NW SE 17-12s-16w, dry, TD 3,630 ft., anhydrite 1,215 ft., Heebner 3,232 ft., Lansing 3,277 ft., sandy conglomerate 3,526 ft., cherty conglomerate 3,568 ft., reworked Arbuckle 3,575 ft., solid Arbuckle 3,582 ft.

Ford County: Mid-West Construction Co. et al 1 Carmichael, C SE 17-25s-24w, dry, TD 4,322 ft., Herrington 2,573 ft., Krider 2,598 ft., Winfield 2,617 ft., Fort Riley 2,655 ft., Topeka 3,687 ft., Lansing 4,184 ft.

Graham County: Derby Oil and Peel 1 Toll, SW SW SE 15-7s-25w, dry, TD 4,246 ft., Topeka 3,497 ft., Lansing 3,739 ft., conglomerate 4,191 ft., Viola 4,220 ft., Arbuckle 4,237 ft.

Continental Oil Co. 1 Holzhauer, NE SW SE 13-10s-21w, dry, TD 3,933 ft., anhydrite 1,735 ft., Lansing 3,534 ft.

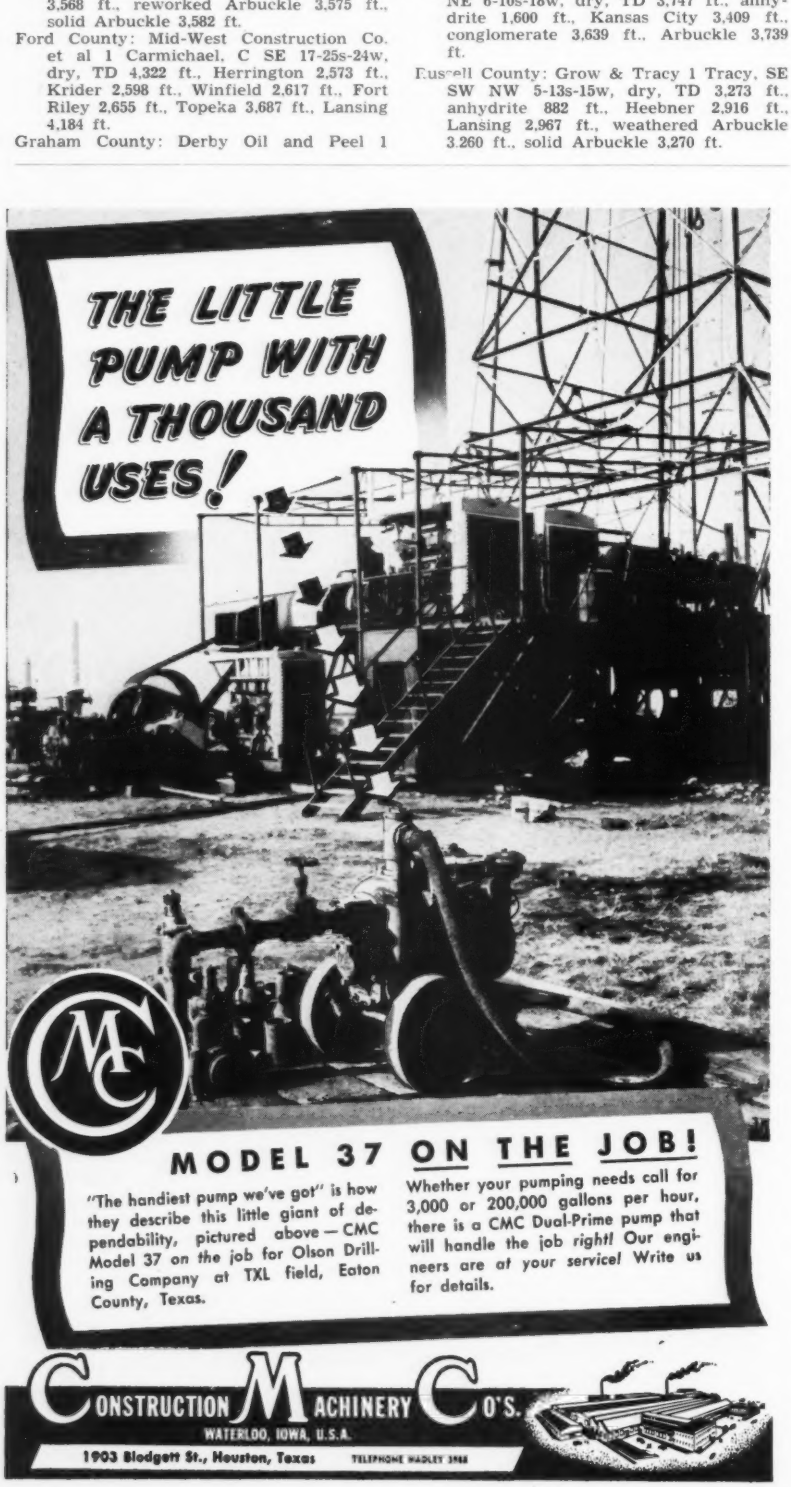
Rooks County: W. L. Hartman 1 Steeples, SE SE NW 31-9s-19w, dry, TD 3,830 ft., anhydrite 1,610 ft., Heebner 3,407 ft., Toronto 3,427 ft., Lansing 3,447 ft., conglomerate 3,717 ft., Arbuckle 3,827 ft.

Vickers Petroleum Co. 1 Hilgers, NE NE NE 6-10s-18w, dry, TD 3,747 ft., anhydrite 1,600 ft., Kansas City 3,409 ft., conglomerate 3,639 ft., Arbuckle 3,739 ft.

Russell County: Grow & Tracy 1 Tracy, SE SW NW 5-13s-15w, dry, TD 3,273 ft., anhydrite 882 ft., Heebner 2,916 ft., Lansing 2,967 ft., weathered Arbuckle 3,260 ft., solid Arbuckle 3,270 ft.

Sedgwick County: Tom Palmer Oil Co. 1 Marshall, SW SE NW 32-28s-1e, dry, TD 3,187 ft., Lansing 2,638 ft., Mississippi 3,142 ft.

Waubansee County: Amerada Petroleum Co. 1 Stewart, SE SW NW 34-10s-10e, dry, TD 2,371 ft., strat test.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MICHIGAN

Akron Field Outpost May Renew Interest in Area

MOUNT PLEASANT. — Flowing natural, by heads from a Dundee pay at the rate of 15 bbl. every 5 hours, E. Edwin Brehm 1 Lathimer, NE NW SW 28-14n-8e, Akron field outpost, Tuscola County, offered prospect of creating new interest and renewed drilling in this district.

Dundee top was logged at 2,632 ft. and at 2,802 ft. hole filled 2,000 ft. with oil in 4 hours and started to flow early the next day. Well is located about 2 miles east of Akron, Detroit River-Monroe zone field and is the best Dundee prospect drilled in the district to date.

The 5-in. long string casing will be set and then hole may be deepened and acidized.

Stray sand gas development in the Isabella Dundee oil field area, Isabella County, proved disappointing on the basis of the results on the first two tests drilled into the sand.

Roosevelt Oil & Refining Corp. 1 Isabella Gas Unit, CNL NW 18-15n-4w, was bottomed out in the Stray at 1,488 ft. with 139,000 cu. ft. of gas showing. Roosevelt 2 Isabella Gas Unit CSL SE 7-15n-14w, was dry in the Stray at 1,523 ft.

In Allegan County, reacidization and tests were being continued on Basin Oil Co. 1 Noteboom, NW SW NW 18-2n-11w, wildcat Traverse test which showed 200 ft. of free oil natural from that zone at 1,618 ft. Wildcat appeared to be good for about 10 bbl. a day natural.

Six of nine Michigan field well completions were rated commercial producers. Four new Dundee wells were finished in Kawawlin field, Bay County, while one producer was added in both Sterling field, Arenac, County, and Beaver Creek field, Crawford County.

Of 14 new starts approved for the week ended December 17, 6 were classified as wildcat oil and gas tests and the balance were field wells.

MICHIGAN WILDCAT FAILURES

Allegan County, Casco Township: Chapman Oil Co. 1 William C. Sill, SE NE SE 8-1n-16w, dry in Traverse lime, TD 1,140 ft.

Hopkins Township: P. K. Degenther 1 Cooke, NE NE SE 27-3n-12w, dry in Traverse lime, TD 1,768 ft.

Lee Township: Ohio Oil Co. 1 Hautau, SE NE NE 2-1n-15w, dry in Traverse lime, TD 1,307 ft.

Monterey Township: Gordon Oil Co. 1 Collier, NE NE SW 25-3n-13w, dry in Traverse lime, TD 1,675 ft.

Valley Township: Ohio Oil Co. 1 Sirrine, SE SE SE 10-2n14w, dry in Traverse lime, TD 1,405 ft.

Grand Traverse County, Fife Lake Township: Taggart Bros. Gas Co. F-1 State-Fife Lake, NW NE NE 26-25n-9w, dry in Coldwater, TD 955 ft.

Isabella County, Rolland Township: Chapman Oil Co. 1 Lake et al, SE SW NE 30-13n-6w, dry in Monroe, TD 3,695 ft.

Kent County, Sparta Township: Robert S. Anderson 1 Poling et ux, NW NE SW 12-9n-12w, dry in Dundee, TD 2,721 ft.

Midland County, Warren Township: Sun Oil Co. A-1 State-Warren, SW SW NW 27-16n-2w, dry in Marshall, TD 1,338 ft.

Van Buren County, Keeler Township: Ohio Oil Co. 1 Wiles, NW SW NE 28-4s-16w, dry in Traverse lime, TD 911 ft.

TEXAS GULF COAST

Amerada Well Discovers Irby Gas-Codensate Field

HOUSTON.—Discovery well of the new "Irby" gas-condensate field approximately 9 miles west of Goliad in Goliad County is Amerada Petroleum Corp. 1 R. F. Irby. On potential gage the well flowed 2,333,000 cu. ft. of gas and 61 bbl. of condensate and 5 bbl. of salt water per day through a 5/32-in. choke, with 4,375 psi. tubing pressure and 4,500 psi. casing pressure. Gravity is 49.2°, with ratio of 33,230. Production is through perforations at 9,242-58 ft. Well is located in M. J. Ybarbo Grant.

A new, deeper gas-condensate pay zone for Harris field, of Live Oak County, has been opened at Continental Oil Co. A-3 Frank C. Goodwin. Well is flowing into separator on a drill-stem test made with ¼-in. chokes through perforations at 9,074-9,120 ft. A 2,000-ft. water cushion was used at the beginning of the test, and the well flowed gas-condensate, and water cushion for 14 hours before turning into the separator for further testing. Working pressure while flowing the cushion was 950 psi. Total depth is 9,608 ft., with 5-in. liner set on bottom. This well is located in Jacob Matson Survey 26.

Chass Production Co. C-1 Holzmark is an east extension well for the southeast sector of Holzmark field of Bee County. On potential test the well gaged 80 bbl. of oil per day on pump from the open hole at 3,520-45 ft. in the Hockley zone. Well is located in the James A. York Survey.

Hassie Hunt Trust 1 Webb, wildcat northeast of Charco, in Maria de Jesus Y'Barbo Grant, Goliad County, has indicated probable oil production in the Yegua zone at the 4,200-ft. level, and gas-condensate production in the Wilcox zone at 7,580-ft. level. On 10-minute drill-stem test at 4,207-14 ft., recovered 720 ft. of pipe-line oil along with 450-ft. water cushion through ¼-in. chokes, with 45 psi. working pressure. Test at 7,571-79 ft., using ¼-in. chokes, with 1,000-ft. water cushion, developed 300 psi. working pressure and flowed gas-condensate, bottom-hole pressures 2,300 psi. open and 3,100 psi. closed. Test at 7,579-89 ft., developed 490 psi. working pressure in 8 minutes.

There were 25 new locations reported for Districts 2 and 3 of which 5 are wildcat starts, 1 each in Goliad, Harris, Live Oak, Montgomery and Victoria counties. Two successful exploratory tests were completed, 1 each in Goliad and Victoria counties. Six wildcats were dry, 1 each in Bee, Fayette, Goliad, Karnes, Live Oak, and Refugio counties.

TEXAS GULF COAST (DISTRICTS 2 & 3) SUCCESSFUL WILDCATS

Goliad County: New gas-condensate pool, "Irby"—Amerada Pet. Corp. 1 R. F. Irby, in M. J. Ybarbo Grant, 9 mi. W of Goliad townsite, top pay 9,242 ft., TD 9,756 ft., perf. 9,242-58 ft., IP: 2,333,000 cu. ft. gas per day and 61 bbl. per day condensate, through a 5/32-in. choke, GOR 33,230, TP 4,375 psi., CP 4,500 psi., gravity 49.2°.

Victoria County: New gas pool—Woodley Pet. Co. 1 Geo. A. Musselman, in W. W. Nichols Sur., 6 mi. NW of Inez and 1 mi. SE of Texas Co. 1 Scott discovery gas well at "Salem" field, top pay 2,266 ft., TD 5,502 ft., perf. 2,266-76 ft., IP: 3,150,000 cu. ft. gas per day on open flow, shut-in pressure 900 psi.

TEXAS GULF COAST (DISTRITCS 2 & 3) WILDCAT FAILURES

Bee County: Dirks Bros. 1 Drexel Cox, in Sec. 3, Ragley Subd., ½ mile E of Tuleta townsite, dry, TD 8,438 ft.

Fayette County: D. C. Bintliff et al 1 N. W. Brown Est., in Jacob Stiffler Sur., 2½ mi. N of Arnim production, dry, TD 5,010 ft.

Goliad County: Claud R. McSpadden et al Mrs. Edith Clarkson, in Edward Dickenson Sur., 10 mi. NW of Greta, dry, TD 6,263 ft.

Karnes County: K. D. Owen et al 1 S. Jurgtis, in A. Hernandez Sur., 4 mi. NE of Falls City, dry, TD 6,205 ft.

Live Oak County: M. L. Massingill & Wilcox Oil Co. 1 Prentice Taylor, in A. H. Lasater Sur. 316, 2½ mi. NE of Whitsett, dry, TD 6,261 ft.

Refugio County: Modesett & Graham 1 Unit 30, town of Woodsboro, 4 mi. S-SW of Refugio field, dry, TD 7,015 ft.

SOUTH LOUISIANA

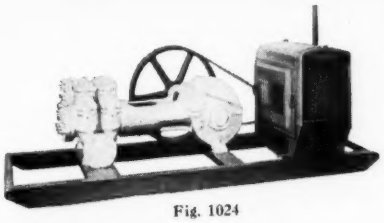
New Oil Pay Is Opened In Grand Isle Area

NEW ORLEANS.—A new oil pay has been opened in the Grand Isle area, Block 10 field, Jefferson Parish, by Humble Oil & Refining Co. 3 Grand Isle State Lease Account 2, Block 18, Tract 1116. Drilled to a total depth of 9,424 ft. in the salt, this well flowed, on 24-hour gage, 625 bbl. of oil per day through a 7/32-in. choke, flowing pressure on tubing 1,475 psi. Gas-oil ratio 609. Production is through perforations at 9,221-36 ft. This well was drilled from the same platform as the 1 State Lease 801, Block 10, the discovery of the field, which is in the Grand Isle area about 8 miles off the Jefferson Parish shore line in the Gulf of Mexico.

Potential gage for Shell Oil Co., Inc., A-1 J. A. Smith, the world's deepest oil producer, in Week's Island, Iberia Parish, flowed at the rate of 420 bbl. of oil per day through a 12/64-in. choke. Gas-oil ratio 1,300, flowing pressure on tubing 2,600 psi. This well was drilled to a total depth of 15,904 ft., with pipe and liner cemented to 14,974 ft. Perforations for completion were made from 14,243-255 ft. A deeper test than the completion level was made

FRANK W WHEATLEY

Feature of the Week



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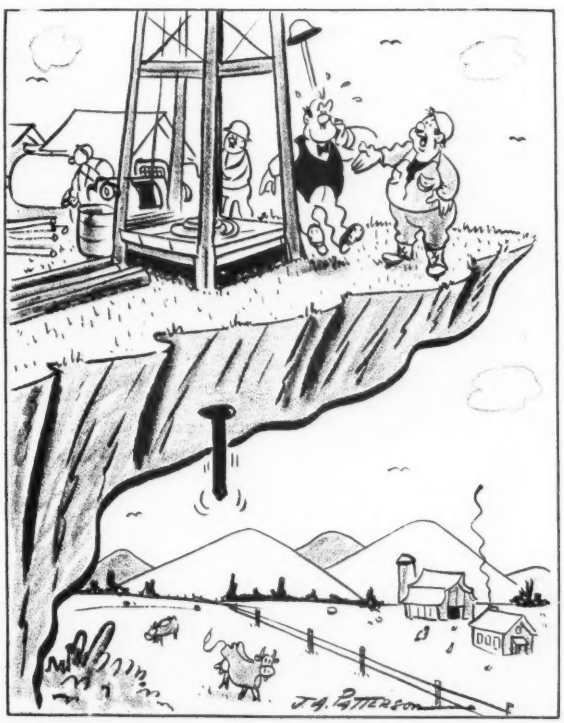

THE OIL AND GAS JOURNAL

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through perforations at 14,904-914 ft., which flowed at the rate of 672 bbl. of oil per day through a ¼-in. choke along with 10,000,000 cu. ft. of gas daily. Flowing pressure while testing was 4,000 psi. Hole was plugged back and completion made through perforations at 14,243-255 ft.

The California Co. 1 State Lease 1277, a wildcat in the Main Pass, Block 69 discovery area in Plaquemines Parish, has been completed. Details on perforations for completion have not been learned. Oil sands were reported at 5,272-5,410 ft., 5,556-64 ft., 5,628-46 ft., 5,682-91 ft., 5,768-5,810 ft., 5,961-83 ft., and 6,272-92 ft. Total depth is 6,326 ft. with 7-in. casing on bottom. This well is located in State Lease 1277, Block 69.

Humble 1 Pelican Island State Lease Account 1, Block 30, a wildcat in the Pelican Island area of Plaquemines Parish, in Gulf of Mexico, 8 miles off shore line, other than being a potential oil discovery, is also another salt dome discovery for the tidelands area. Salt was topped at 2,983 ft. Total depth is 7,500 ft. Sand showing oil was encountered at 2,152-85 ft. Pipe has been perforated from 2,764-68 ft. for initial test.

The 35 new locations reported this week included 5 wildcat starts, 1 each in Allen, Cameron, Iberia, St. Helena and St. Mary parishes. One successful exploratory test opened a new oil sand in Weeks Island, Iberia Parish, and two wildcats were dry, 1 each in Beauregard and Vermilion parishes.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Iberia Parish: New oil sand, Weeks Island Shell Oil Co., Inc., A-1 J. A. Smith, 18-14s-7e, TD 15,094 ft., top sand 14,243 ft., perf. 14,243-55 ft., IP: 420 bbl. oil per day through 12/64-in. choke, GOR 1,300, TP 2,600 psi., gravity 33°. This is the world's deepest oil production.

SOUTH LOUISIANA WILDCAT FAILURES

Beauregard Parish: Honolulu Oil Corp. 1 S. N. Berry 8-3s-8w, 4 miles southeast of DeRidder townsite, 13 mi. E of Neale production, dry, TD 9,521 ft.

Vermilion Parish: Placid Oil Co. 1 Aubrey J. Marceaux, 20-12s-2e, dry, TD 12,031 ft.

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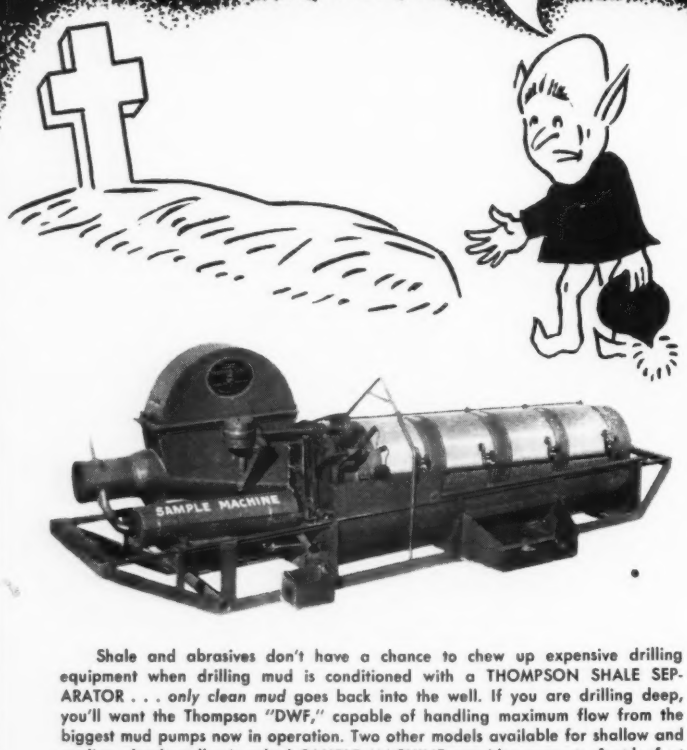

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N. CENTRAL TEXAS

Continental Discovery Tests 1,200 Bbl. Daily

WICHITA FALLS. — Continental Oil Co. completed its Bend conglomerate discovery southeast of Bowie, in Montague County, for a calculated daily flowing potential of 1,200 bbl. The new well, 1 Richardson, Block 79, Titus CSL Survey, flowed 125 bbl. of oil in 3 hours on completion test, from casing at 6,054-73 ft. Gas-oil ratio was 700 cu. ft.

The 1 Richardson was acidized with 3,000 gal., and loaded with 230 bbl. of oil. After recovery of acid residue and load oil, the well kicked off and flowed 390 bbl. of new oil in 15 hours. After the 15-hour flow, it gaged 43 bbl. of oil in 1 hour, and was shut in for potential.

New pay in the Ellenburger was opened in the Odell Canyon lime field of Wilbarger County at Humble Oil & Refining Co. 4 Morgan-Berry, Section 5, Block 11, H&TC Survey. The well flowed 216 bbl. of 44.7°-gravity oil in 24 hours, from the new zone at 6,474-6,574 ft.

First Ellenburger production for Jack County was opened by Sorrells Oil Co. 1 Campsey, Block 31, Wood County School Land Survey, 9 miles east of Antelope. The Ellenburger was topped at 6,334 ft., drilled to 6,465 ft. and cased to 6,420 ft. According to first reports, top of pay was around 6,380 ft. When the plug was drilled out to 6,465 ft., and the hole cleaned, it was treated with 750 gal. of acid, but failed to respond. A second treatment of 3,000 gal. was made and the well kicked off and flowed through open 2-in. tubing after the swab was run a few times. All available storage was filled, at the rate of 425 bbl. of oil a day, and the well was shut in for storage and potential tests. The oil tested 56° gravity, but indicated gas-oil ratio was said to be below 2,000 cu. ft. Sorrells holds approximately 2,000 acres surrounding the discovery.

Warren Oil Corp. and Wichita River Oil Co. staked location for 1 D. O. Gilghman, 3 miles southwest of Jacksboro, as a 6,000-ft. Ellenburger test. The new wildcat is 330 ft. from north and 3,580 ft. from east lines of Block 4, Navarro County School Lands Survey.

In Throckmorton County, Cities Service Oil Co. and Sinclair Prairie Oil Co. staked location for a 6,000-ft. Ellenburger wildcat in the approximate center of the 106,000-acre SMS Ranch of the Swenson Land & Cattle Co. The ranch was said to have been leased about a year ago by the two companies who have detailed the block with seismograph. The test will be drilled as the 1 SMS, 330 ft. from north and west lines of the northeast quarter, Block 100, BBB&C Survey, 6½ miles east of the Haskell County line, and about 13 miles northwest of Throckmorton.

Four miles northwest of Throckmorton, and about 1 mile west of Strawn sand production in the Manning-Herrington field, Fred M. Manning, Inc., 1-L Goodstein & R. A. Brown was showing for production in the Caddo. A 1-hour drill-stem test from top of the zone at 4,560 ft. to 4,571 ft. brought gas to the top in 4 minutes and recovered 1,600 ft. of oil, 40 ft. of brackish oil-cut mud and 200 ft. of salt water. Operators were to drill another 20 ft. and test again. It was to drill ahead to the Missis-

sippi before attempting completion in the Caddo.

NORTH CENTRAL TEXAS (DISTRICTS 9 & 7-B) WILDCAT FAILURES

Callahan County: Anzac Oil Corp. 1 S. D. Montgomery, Sec. 218, T. H. Brown Sur., 9 mi. NW Cross Plains, dry, TD 3,948 ft., Ellenburger 3,896 ft., elev. 1,730 ft.

Comanche County: C. R. Gay 1 Chester Johnson, J. J. Blakeman Sur., 7 mi. N Comanche, dry, TD 2,659 ft., Ellenburger 2,532 ft., elev. 900 ft.

Erath County: Lewis Mahan 1 Noah Grimes "A," B. Bromley Sur., 3 mi. NW Stephenville, dry, TD 4,456 ft., Ellenburger 4,412 ft., elev. 1,350 ft.

Jones County: C. U. Bay et al 1 E. E. Farnsworth, Blk. 360, Goliad CSL, 9 mi. W Anson, dry, TD 3,365 ft.

Shackelford County: H. B. Hummert, Jr., 1 F. C. Taylor, Sec. 8, Blk. 11, T&P Sur., 1 mi. N Albany, dry, TD 850 ft.

Taylor County: Drilling & Exploration Co., Inc., 1 A. M. Hinds, K. K. Liggett Sur., 2 mi. N Tye, dry, TD 2,785 ft., Flippen sand 2,225 ft.

B. F. Findley 1 S. J. Dalton, Blk. B, Merkel townsite, dry, TD 2,812 ft., Sedwick 1,780 ft., Dotham lime 2,235 ft., elev. 1,870 ft.

S. C. Herring 1 C. C. Compere, Lot 3, Blk. 24, W. W. Sills Sur., 2 mi. NW Abilene, dry, TD 2,525 ft.

West Central Drilling Co. 2 Robert Riney, Lge. 146, Grimes CSL, 5 mi. S Merkel, dry, TD 2,758 ft., Flippen 2,581 ft.

SOUTHWEST TEXAS

New Production Is Found In Brooks County

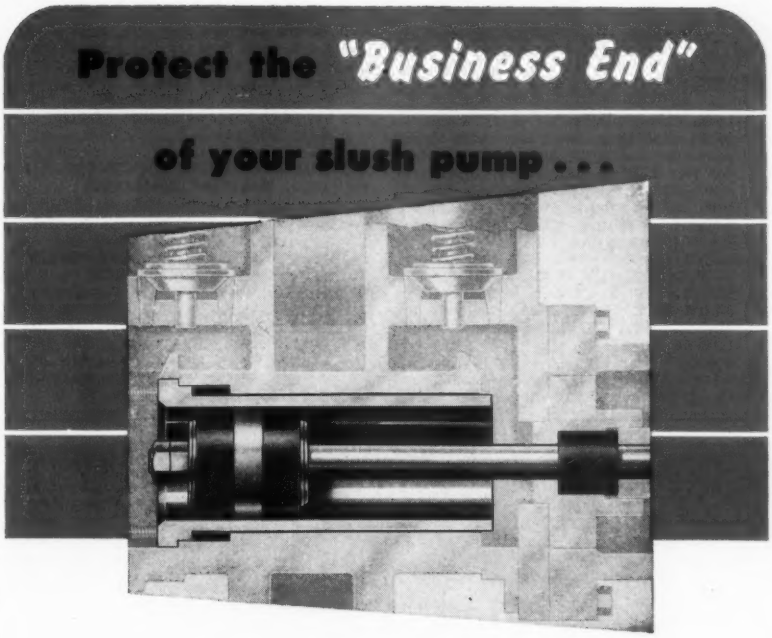
CORPUS CHRISTI.—George H. Echols 1 Mrs. Donald Alexander opened the first commercial oil production on the Palo Blanco dome, in northwestern Brooks County. Well has been turned into the tanks, flowing 40.9°-gravity oil. No potential gage has been reported as yet. Oil sand is from 3,603-14 ft. Total depth is 3,614 ft.

New oil production in McMullen County has been opened at Amman & McNabb A-7 Dolph, 17 miles southeast of Tilden, which gaged 34 bbl. of oil per day on pump. Well is producing from open hole at 1,356-68 ft.

McFarland Drilling Co. 2 Henrietta Krisch et al, a new oil discovery in Atascosa County, approximately 3 miles north of Poteet, gaged 127.5 bbl. of 41.4°-gravity oil per day through a ¼-in. choke with no water or gas on potential test from open hole at 3,562-3,612 ft. Tubing pressure was 150 psi., casing sealed. Production is from the Anacacho lime, topped at 3,570 ft. This well is in Survey 1,207. Tentative locations for two tests have been reported. Bering Co. 1 W. W. Williams is to be spotted ½ mile southeast of the Poteet field discovery and Herman Brown et al 1 Mrs. Mary Stanush, to be in Survey 1,340, ½ mile northeast of the Poteet discovery.

Lewis Oil Co. A-1 Oppenheimer & Lang, gaged 81.54 bbl. of oil per day through a 3/16-in. choke on potential test from open hole at 5,597-5,605 ft. Total depth is 5,742 ft., with plugged back depth at 5,605 ft. This well is in BS&F Survey 13, 10 miles southwest of Charlotte and is the second producer in a new field for Frio County.

There were 49 new locations reported for Districts 1 and 4, of which 14 are wildcat starts, 4 in Duval, 2 each in Atascosa and Zapata, and 1 each in Frio, Hidalgo, Kenedy, Kinney, Milam and Webb counties. Three successful exploratory tests were reported, opening two oil pools, one each in Atascosa and McMullen and one gas pool in Starr County. Thirteen wildcat failures were reported, three in San Patricio, two in Webb, and one each in Bexar, Duval,



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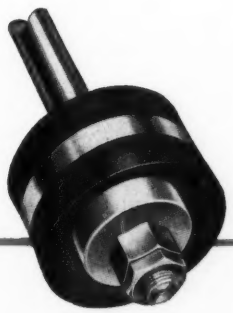

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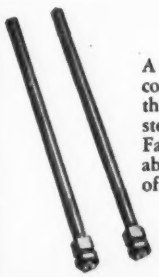

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SOUTHEAST TEXAS (DISTRICTS 1 & 4) SUCCESSFUL WILDCATS

Atascosa County: New oil pool, "Poteet"—McFarland Drlg. Co. 2 Henrietta Krisch et al, in Sur. 1207, 3 mi. N of Poteet, top pay 3,570 ft., TD 3,612 ft., open hole 3,562-3,612 ft. in Anacacho lime, IP: 127 bbl. oil per day through ¼-in. choke, no gas, TP 150 psi., casing sealed, gravity 41.4°, no water.

McMullen County: New oil pool—Amman & McNab, Ltd., A-7 Mrs. Annie Graves Dolph et al, in L. Musquiz Sur. 12, in Jourd area, 17 mi. SE of Tilden, top pay 1,356 ft., TD 1,368 ft., open hole 1,356-68 ft., IP: 34 bbl. oil per day on pump.

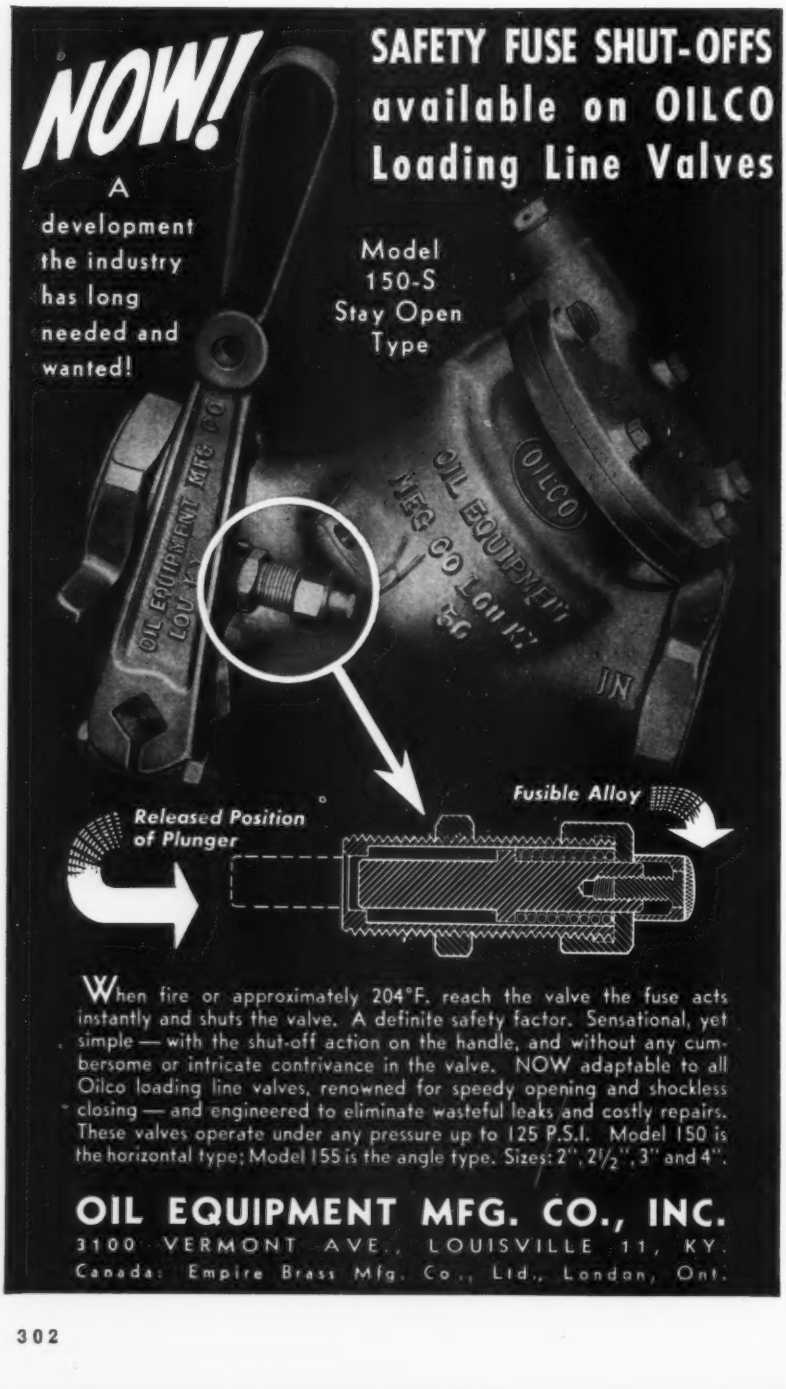
Starr County: New gas pool—The Texas Co. 1 Samuel D. Bloomberg et al, in Xavier Zamora Porc. 41, A-77, 3,100 ft. E-NE from Sun Oil Co. 1 M. Flores gas discovery well in Porc. 40, at "Flores" field. Top pay 8,855 ft., TD 10,011 ft., perf. 8,855-80 ft., IP: 700,000 cu. ft. gas per day on open flow, shut-in pressure 5,465 psi.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) WILDCAT FAILURES

Bexar County: Anderson-Prichard Oil Corp. and Transwestern Royalty Co. 2 E. H. Yturria, in Adam Stafford Sur. 49, 8 mi. SE of San Antonio, dry, TD 1,550 ft.

Duval County: Hiawatha O. & G. Co. 2 Raul Oliveira, in San Andres Grant, 4 mi. SE of Benavides, 1 mi. SE of Vaello field, dry, TD 5,901 ft.

Hay County: Gilliam Drilling Co. 1 J. R. Alexander, in Otis G. Eels Sur., 9 mi. N of Lockhart, dry, TD 2,028 ft. in Edwards lime.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Jim Hogg County: Hewit & Dougherty 1 Joseph Gruey, Jr., et al, in Noriacitas Grant, 2 mi. N of Hebbronville, dry, TD 4,520 ft.

McMullen County: Harry Ezzell, Agt. A-7 Harry Ezzell, in Sec. 24, Hayes-Ezzell Ranch Subd., A. Olivero Sur., 7 mi. SW of Simmons City, dry, TD 1,367 ft.

San Patricio County: Arnold O. Morgan and Garland Clymore 1-B E. H. Lane, in Coleman-Fulton Pasture Co. Subd. of P. Fitzsimmons Lge., 4 mi. SW of Sinton, dry, TD 7,006 ft.

Quintana Pet. Co. 1 W. G. McCampbell, in Robert M. Williamson Sur., 5 mi. NE of Gregory, dry, TD 12,480 ft.

H. R. Smith 1 Callie Freeman, in Pat Nevin Sur., 4 mi. NW of Mathis, dry, TD 4,736 ft.

Starr County: Coastal Refining, Inc., et al 3 M. Yzaguirre, in GB&CNG Sur. 227, 2 mi. E of Cameron field, dry, TD 7,015 ft.

Webb County: O. W. Killam 1 Armstrong-Stroman, in Las Animas Grant, 1½ mi. E of Glen field, dry, TD 3,515 ft.

Lundells, Inc., 1 J. E. Neal, in T&NO Sur. 132, 3 mi. SW of Bruni, dry, TD 2,442 ft.

Zapata County: Bridwell Oil Co. and W. C. McBride, Inc., A-1 Robert Hinnant, in Sur. 112, 10 mi. S of Mirando City, dry, TD 1,645 ft.

Zavala County: Sun Oil Co. 3 D. N. Pryor, in Antonio Aguirre Grant, 6 mi. NE of La Pryor, dry, TD 2,800 ft.

EASTERN TEXAS

Danciger Test Cores Oil Stains

DALLAS.—Danciger Oil & Refining Co. 1 New Birmingham Development Co., J. H. Lindsey Survey, 4½ miles northwest of Alto in Cherokee County, was reported taking a drill-stem test after coring stains of oil, with some gas, in the Woodbine at 5,305-53 ft. On an elevation of 561 ft., the well logged the Austin chalk at 5,113 ft. Further details were not available.

Northwest of Maydelle, Standard Oil Co. of Texas 1 Acker continued testing perforations in the Rodessa lime at 8,610-50 ft. On 7/16-in. choke, the well flowed at the rate of 6,450,000 cu. ft. of gas a day. Field yield was 2 bbl. an hour, testing 80 per cent oil and 20 per cent water. Tubing pressure was 1,800 psi. and casing pressure was 800 psi.

Humble Oil & Refining Co. 1 E. N. Rylie, 4 miles southeast of Kemp, Kaufman County, was reaming below 5,604 ft. It cored hard lime with streaks of hard shale at 5,565-5,604 ft. Humble 1 J. W. Minton, 9 miles northeast of Hemphill in Sabine County, was running electrical surveys at 2,618 ft.

Magnolia Petroleum Co. 1 L. W. Pierce, northeast of Mount Sylvan in Smith County, was drilling in shale at 6,136 ft. It logged the Woodbine at 5,270 ft., on elevation of 571 ft.

In Wood County, 4 miles north of Mineola, White & Webb Drilling Co. 1 Mrs. B. A. Shirey, D. Fuller Survey, was waiting on orders at total depth of 4,869 ft. in sand. Cores at 4,852-59 ft. recovered 7 ft. of shaly sand, having oil saturation and odor. Recovery from 4,859-69 ft. was 10 ft., being 2 ft. of shaly sand with oil saturation and odor and 8 ft. of ashy sand with no shows. An attempted drill-stem test from 4,850-4,859 ft. plugged the tool in 20 minutes, and recovered 10 ft. of mud with no shows. A second test from 4,840-69 ft., open 50 minutes, recovered 780 ft. of salt water. The prospective pay is in the sub-Clarksville.

EAST TEXAS (DISTRICTS 5 & 6) WILDCAT FAILURE

Collin County: Kightlinger & Jenko 1 J. L. Uland, Susannah Walker Sur., 4½ mi. N Farmersville, dry, TD 2,810 ft.

PERMIAN BASIN

Gaines County May Get Ellenburger Production

MIDLAND.—Shell Oil Co., Inc., 1 Hawkins, south-central Gaines County wildcat, was reported showing for the country's first Ellenburger production. Operators were coming out of the hole after a 4-minute drill-stem test at 12,174-251 ft., total depth, and full details of the test were not available. However, it was said to have shown gas at the surface in 15 minutes, and when drill pipe was pulled, the well unloaded oil with each stand of pipe. One estimate placed the recovery from drill pipe at 150 bbl. Location is 1,983 ft. from north and 665 ft. from east lines of Section 8, Block A-23, PSL Survey, 2½ miles southwest of Permian production in the Robertson field, and 15 miles south and slightly west of Seminole.

Magnolia Petroleum Co.'s seventh drill-stem test at its 1-A TXL, prospective Ellenburger discovery in north Upton County, apparently took it out of the pay. This last test, from 12,805-875 ft., recovered 60 ft. of mud with no oil, gas or water, in 2 hours. Operators were drilling deeper. The well's sixth drill-stem test, from 12,750-805 ft., establishing pay from top of the formation at 12,536 ft. to 12,805 ft., brought gas to the top in 1 hour and 45 minutes, and recovered 120 ft. of clean oil, 270 ft. of heavily oil and gas-cut water blanket, 1,730 ft. of water blanket and 180 ft. of oil and gas-cut mud. There was no formation water reported.

Another Pennsylvanian discovery was in prospect for southwestern Scurry County at Lion Oil Co. 2 E. C. McLaughlin, which flowed an estimated 20 bbl. of oil an hour from the upper section of the Pennsylvanian at 6,578-6,610 ft., on its second test of the formation. The first test, from 6,550-80 ft., flowed gas in 6 minutes and recovered 790 ft. of 39.5°-gravity clean oil, plus 510 ft. of heavily oil and gas-cut mud. There was no formation water. Length of the test was 50 minutes. Operators then drilled deeper and ran a test from 6,578-6,610 ft., total depth. Using ⅞-in. bottom-hole choke, and packer at 6,578 ft., gas came to the surface in 5 minutes and flowing oil in 58 minutes. Oil, which tested 43.2° gravity, flowed into pits for 12 minutes at an estimated rate of 20 bbl. an hour. The tool was closed at the end of 70 minutes, and the drill pipe unloaded for a like period as it was pulled. When the flow stopped, operators removed the remaining oil by reverse circulation.

Further development in the Bronte (Palo Pinto) field of Coke County was reported at American Republics Corp. 1 J. A. Perciful, ¼ mile north offset to the discovery, and the third well for the area. A drill-stem test from 4,365-4,420 ft., open 1 hour and 45 minutes, recovered 1,400 ft. of oil estimated at 48°-50° gravity. There was no water. The 1 Perciful previously recovered 313 ft. of oil and gas-cut mud on a 2-hour test from 4,372-4,405 ft. Operators were to run electrical surveys and set casing around 4,379 ft.

Wood River Oil & Refining Co. 1 J. W. Lutz became the second producer in the Abell Silurian field of northern Pecos County, with a natural flow of 1,017 bbl. of 41°-gravity oil in 24 hours, through 18/64-in. tubing choke, from perforations at 5,010-18 ft. Gas-oil ratio was 812 cu. ft., and flowing tubing pressure 975 psi. Top of pay was 4,996 ft.

WEST TEXAS (DISTRICTS 8 & 7-C) SUCCESSFUL WILDCATS

Andrews County: Champlin Refining Co. 1-F University, Sec. 34, Blk. 12, University Lands, 20 mi. W Andrews, 4 mi. W Fullerton Devonian production, pumped 80 bbl. 42.7°-gravity oil, 40 bbl. water, GOR 426 cu. ft., Clear Fork 7,131-67 ft., TD 8,700 ft., elev. 3,319 ft.

Tom Green County: Placid Oil Co. 1 L. T. & L. C. Clark, Sec. 2, HE&WT Sur., 6 mi. W Water Valley, NW corner of county, pumped 43 bbl. 35°-gravity oil a day, San Andres 1,035-45 ft., TD 7,838 ft., PB 1,045 ft., elev. 2,248 ft.

Upton County: Wilshire Oil Co. 23-148 McElroy Ranch Co., Sec. 148, Blk. E, CCSD-&RGNG Sur., 5 mi. E McElroy field, pumped 227 bbl. 36.8°-gravity oil a day, GOR 200 cu. ft., Wolfcamp 7,800-8,005 ft., TD 13,977 ft., PB 8,005 ft., elev. 2,749 ft.

WEST TEXAS (DISTRICTS 8 & 7-C) WILDCAT FAILURES

Borden County: Seaboard Oil Co. 1 Mayme Clanton, Sec. 20, Blk. 32, T&P Sur., 1 mi. NW Vealmoor field, dry, TD 8,340 ft., San Andres 3,170 ft., Reef lime 8,238 ft., elev. 2,610 ft.

Cochran County: C. L. Norsworthy, Jr., 1 J. R. Mims, Sec. 40, Blk. W, T&P Sur., 4 mi. NW Divide, dry, TD 8,010 ft., Ellenburger 7,614 ft., elev. 2,457 ft.

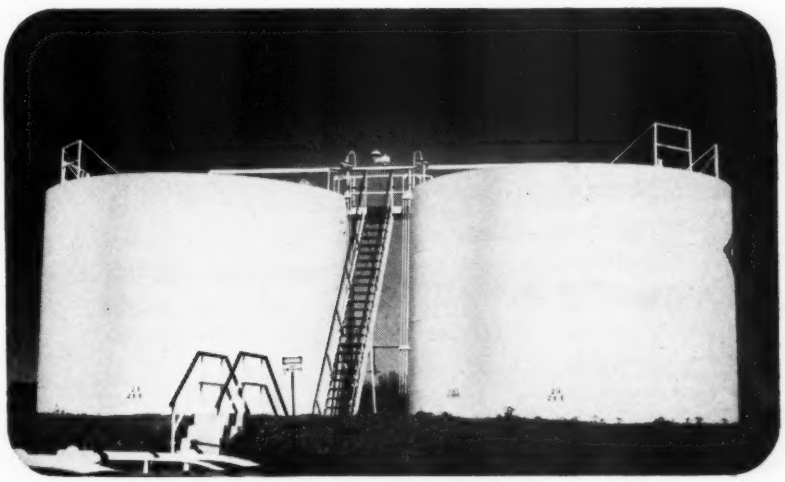
Culberson County: Mills-Lee 4 Fisher, Sec. 12, Blk. 110, PSL Sur., dry, TD 545 ft.

Ector County: Stanolind Oil & Gas Co. 1-F B. H. Blakeney, Sec. 5, Blk. A, PSL Sur., 3 mi. N Goldsmith field, dry, TD 11,750 ft., San Andres 4,290 ft., Glorietta 5,630 ft., Pennsylvanian 8,840 ft., Devonian 11,037 ft., elev. 3,161 ft.

Glasscock County: Sohio Petroleum Co. 1 M. A. Ludaney, Sec. 40, Blk. 34, T&P Sur., 11 mi. NW Garden City, dry, TD 2,806 ft.

Pecos County: Pacific Western Oil Corp. 1 J. L. Nutt, Sec. 17, Blk. 125, T&St.L. Sur., dry, TD 9,850 ft., Yates 1,550 ft., San Andres 2,640 ft., Wolfcamp 5,931 ft., Simpson 7,800 ft., Ellenburger 9,670 ft., elev. 2,971 ft.

The Texas Co. 1 D. J. Sibley, Sec. 10, Blk. 119, GC&SF Sur., 4 mi. E Fort Stockton field, dry, TD 4,050 ft. in dolomite.



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White Eagle Oil Co. 1 R. E. Ringo, Sec. 8, Blk. H, L&SV Sur., 14 mi. N Texon, dry, TD 12,056 ft., Strawn 10,270 ft., Barnett shale 10,570 ft., Woodford 11,000 ft., Devonian 11,032 ft., Fussellman 11,580 ft., Ellenburger 11,794 ft., elev. 2,611 ft.

Scurry County: Fred S. Barrett 1 C. D. Gray, Sec. 191, Blk. 3, H&GN Sur., 2 mi. W Dunn, dry, TD 3,200 ft.

SOUTHEAST NEW MEXICO

HOBBS.—Barnsdall Oil Co. 1-A State, 23-8s-32e, Chaves County, placed a tentative top on the Mississippian at 10,875 ft., on an elevation of 4,459 ft. It was coring black shale below 11,485 ft., with no shows.

In the Crossroads area, Lea County, Magnolia Petroleum Co. 1-C Santa Fe-Pacific, 26-9s-36e, was drilling below 12,050 ft. Mid-Continent Petroleum Corp. 1 Dessie Sawyer, 27-9s-36e, recovered water blanket and 120 ft. of drilling mud with no shows, on a 30-minute drill-stem test at 11,394-594 ft., apparently still in the Mississippi. Skelly Oil Co. 1 Sawyer, 33-9s-36e, was drilling in shale at 12,012 ft. Mid-Continent 1-B Sawyer, 34-9s-36e, recovered water blanket and 1,200 ft. of drilling mud on a 1-hour and 15-minute drill-stem test at 11,816-916 ft. It drilled ahead below 11,940 ft.

Continental Oil Co. 1-B-29 Warren Unit, NW SE 29-20s-38e, completed in the McKee sand of the Simpson for a calculated daily potential of 3,528 bbl. of oil a day, based on a flow of 441 bbl. in 3 hours. Pay zone was around 8,955-9,070 ft., total depth. Location of the new discovery is 3 miles north of the Drinkard field.

SOUTHEAST NEW MEXICO SUCCESSFUL WILDCAT

Lea County: Continental Oil Co. 1 Warren Unit B-29, NE SE 29-20s-38e, 6 mi. N Eunice, 6 mi. N Simpson production in Brunson field, top McKee 8,943 ft., pay 8,965-9,050 ft., flowed 441 bbl. oil 3 hours, 1-in. choke, GOR 660 cu. ft., gravity 40°, tubing pressure 325 psi., elev. 3,534 ft., TD 9,070 ft.

SOUTHEAST NEW MEXICO WILDCAT FAILURES

Lea County: Emperior Oil Co. 1 State, NE SE 6-21s-34e, dry, TD 3,957 ft., sand 3,952 ft.

The Texas Co. 1 Z. A. McMillan, NW SW 3-19s-37e, dry, TD 7,448 ft., Yates 2,820 ft., San Andres 4,170 ft., Glorietta 5,630 ft., elev. estimated 3,675 ft.

MISSISSIPPI

Heidelberg-East Well Completed for 176 Bbl.

JACKSON.—Sun Oil Co. 4 Booker T. Jones, 31-1n-12e, in Heidelberg-East field, Jasper County, has been completed flowing 176 bbl. of oil per day through a 3/16-in. choke, tubing pressure 175 psi. Total depth is 4,909 ft. with production through perforations at 4,812-69 ft.

In LaGrange field, Adams County, Sohio Petroleum Co. 3 Parker-Baker, Lot 175, 34-6n-2w, was drilled to a total depth of 6,501 ft., and was completed on pump for initial production of 104 bbl. of oil per day. Production is through perforations at 6,217-23 ft.

The California Co. 3 L. Bowman, 19-6n-8e, in Mallalieu field, Lincoln County, flowed an initial production of 330 bbl. of 36.1°-gravity oil per day through a 21/64-in. choke, tubing pressure 140 psi. Total depth is 10,480 ft., with perforations for completion at 10,458-66 ft.

Gulf Refining Co. 13 Bass, 9-1n-16w, in Baxterville field, Lamar County, was completed on pump for initial production of 47 bbl. per day. Total depth is 9,000 ft.

One wildcat start was reported for Warren County and two development locations were made, one each in Sandy Hook field.

Marion County, and Yellow Creek field, Wayne County. One wildcat failure was reported in Wayne County.

MISSISSIPPI WILDCAT FAILURE

Wayne County: Southeastern Drilling Co. 1 Masonite Corp., NW/c NW NE 22-8n-7w, dry, TD 7,250 ft. Top Tuscaloosa 5,727 ft., M. Tuscaloosa 6,473 ft., Lower Tuscaloosa 6,663 ft., Lower Cretaceous 7,017 ft.

ROCKY MOUNTAIN

Hot Springs County Well Gets Oil in Tensleep

DENVER.—Oil was recovered on drill-stem test in the top of the Tensleep at the Seaboard Oil Co. and Husky Refining Co. wildcat at 1 Government, NW NE SW 2-44n-96w, Hot Springs County, Wyoming, on the Little Sand Dray structure. The test was made between 6,075-95 ft. and in 1 hour 1,170 ft. of clean oil with a little mud was recovered. The oil is 36° gravity, asphalt base. Top of the Tensleep was logged at 6,056 ft. and a core between 6,055-95 ft. showed 1 ft. of black shale and 22 ft. of porous, well saturated Tensleep sand. The operator has run casing to the Tensleep and will drill further into sand before completion. Oil was also found in the Embar formation in this well, with as much as 4,770 ft. of oil recovered in 2-hour drill-stem test. Top of Embar was logged at 5,831 ft. This structure is between the Gebo and Golden Eagle fields, and the block is held jointly between Seaboard and Husky, with Husky to be the operator following discovery.

In the first deep test of Beaver Creek field, Fremont County, Wyoming, Stanolind Oil & Gas Co. recovered oil in the top of the Tensleep sand. The well is 11 Unit, CN½ SE 10-33n-96w, and flowed at the rate of 8 bbl. of 42°-gravity oil per hour on drill-stem test between 10,445-65 ft. The tool was open 45 minutes. The operator is now coring below 10,512 ft. in the well with top of the Tensleep at 10,442 ft. This field is 12 miles northwest of Sand Draw field, which produces oil from the Tensleep. The field was first discovered in 1938 with a Lakota sand gas well, and there are now nine wells completed in this formation in the field. The structure is large, with a unit covering 15,726 acres operated by Stanolind.

An apparent 3-mile southwest extension to Mush Creek field is now being completed by Morton Oil Co. at 1 Borgalli, NW SW SW 26-44n-65w, Weston County, Wyoming. The well made 580 ft. of oil in 30 minutes, with gas to the surface in 8 minutes, on test between 4,925-85 ft. Shut-in pressure was 2,550 psi. Top of the Newcastle was logged at 4,925 ft. and it is reported 30 ft. of saturation was logged in the well. This extension is of importance in an area that has been active since development drilling started in the Mush Creek area a year and a half ago. There are now more than 100 wells completed in this field and daily average production is reported above 5,000 bbl. Shows of oil in the Newcastle are also reported for Esperado Mining Co.'s Northwest Lodgepole extension well in the C SE SW 16-45n-67w, 20 miles northwest of Mush Creek. This well was last reported at around 7,300 ft., total depth, with shows of oil in the Newcastle. No official information has been released on the well. During the last year Newcastle (Muddy) discoveries were made at Skull Creek, east of Mush Creek, and at Fiddler Creek, northwest of Mush Creek, and development drilling is now being conducted in these two fields.

Western Natural Gas Co., Byrd-Frost, Inc., et al have completed tests on their gas and distillate discovery at 1 Driscoll, C NE½ NE NW 3-38n-19w (NMPM) Montezuma County, Colorado, and the well has been shut in pending marketing arrangements. Tentative location for a new well is in the C NW NE 9-38n-19w, southeast of the discovery well. Tests were made in the top of the Paradox formation on the discovery through various sized chokes and a definite sustained production was reportedly established. Production on 20-hour test averaged 20 bbl. hourly of 68°-gravity distillate and 5,000,000 cu. ft. of gas daily.

New locations.—There were 22 new locations, with 14 of the wells in Wyoming, 4 in Montana, 3 in Colorado and 1 in northern New Mexico. In Wyoming, Amerada made location for a 5,000-ft. Lakota test at 1 Cortes, C SW SW 18-49n-67w, in the Moorcroft area, Crook County. Stephens et al are drilling below 900 ft. in the Gypsum Creek area, SW SW NW 22-58n-96w, Big Horn County. In the Armstrong area of Colorado, Plains Exploration and others made location for 1 Haley Smith Co., NW NW NE 26-11n-54w, for a Dakota test. Sterling Drilling Co., Bay Petroleum Corp. and others are joining in the wildcat.

Completions.—There were 32 wells completed in the region, with 20 in Wyoming, 9 in Colorado and 1 each in Montana, Utah and northern New Mexico. In Wyoming completion was announced for Continental's North Danker wildcat as a Frontier gas discovery. The well was drilled to 6,306 ft. in the Madison and all zones below the Frontier carried water. The well was completed for 2,946,000 cu. ft. of gas daily. Texas abandoned the southwest Table Rock wildcat, Sweetwater County, and Carter abandoned the Red Hills wildcat in the Jackson Hole area.

WYOMING WILDCAT FAILURES

Southwest Table Rock, Sweetwater County: The Texas Co. 1 Unit, C SE NW 28-18n-98w, 4,601 ft. TD, abnd. in upper Cretaceous sands.

Red Hills, Teton County: Carter of Oil Co. 1 Treglown, SE NE SE 1-42n-114w, 1,231 ft. TD, abnd., Tensleep 749 ft. Amsden 780 ft., Darwin 1,053 ft., Madison 1,153 ft.

COLORADO WILDCAT FAILURES

Agate area, Elbert County: H. Flader 1 State, C NE SW 8-7s-59w, 2,492 ft. TD, suspended indefinitely.

Brand dome, Jackson County, Fadge Oil Co. 1 Edwards, C SE SE 6-8n-81w, 1,150 ft. TD, suspended indefinitely.

Skull Creek, Moffat County, Richfield Oil Co. of Montana 1 fee, SE SE SE 15-4n-101w, 4,055 ft. TD, suspended indefinitely.

Oklahoma Oil Co. 1 Goff, C NW SE 2-3n-101w, 1,290 ft. TD, PB 400 ft., suspended indefinitely. Morrison 891 ft.

Oak Creek, Routt County: R. E. Havenstrite 2 Ryles, NW SW NE 2-3n-86w, 6,312 ft. TD, shut down for winter. Dakota 5,825 ft., water.

UTAH WILDCAT FAILURE

Grantsville, Tooele County: Bonneville Oil & Gas 1 Worthington, C SE NE 14-2s-6w, 3,115 ft., TD, suspended indefinitely.

APPALACHIAN FIELD

No Wildcat Completions For W. Va. or S.W. Pa.

PITTSBURGH.—No completions were reported in wildcat drilling in West Virginia or Southwest Pennsylvania.

In Davis district, Tucker County, West Virginia, Cumberland & Allegheny Gas Co. 1-A-418 West Virginia Power & Transmission Co. reported a slight increase in the flow of gas in the Oriskany sand and drilling is at a depth of 8,146 ft. In Beaver Pond district, Mercer County, United Fuel Gas Co. has commenced drilling and has reached the depth of 85 ft. in the 6478 A. W. Hicks and in Big Creek district, McDowell County, its 6219 New River & Pocahontas Coal Co., at a depth of 6,854 ft., is changing wire line. In Portland district, Preston County, William E. Snee 3 Sisler is pulling the 6-in. casing preparatory to deepening operations. In this same district, Hope Natural Gas Co. 9315 P. S. Pyles is drilling at 671 ft. In Grant district, Ritchie County, Hope Natural Gas Co. 9300 Jessie Powell is drilling at 2,400 ft.; and in Glade district, Webster County, this company's 9227 West Virginia and Pittsburgh Railroad Co. is drilling at 5,800 ft.

In Shade Township, Somerset County, Pennsylvania, Peoples Natural Gas Co. 3725 R. F. Grove, elevation 2,343 ft., with the bottom of the Oriskany sand reported at 9,165 ft., showed salt water at 9,225 ft. This well is now drilling at 9,270 ft. In Georges Township, Fayette County, Orville Eberly

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et al, 1 John Dulick is bailing water before commencing to acidize. In Derry Township, Westmoreland County, Peoples Natural Gas Co. 3814 Camilla Giffin is shut down at 7,911 ft.; and in Unity Township, this company's 3830 William Piper is drilling at 5,222 ft.

New locations reported were five: Kiskiminetas and South Bend townships, Armstrong County; and Allen and Nottingham townships, Washington County.

CANADIAN FIELDS

Success Assured at Leduc Extension

CALGARY.—British American Oil Co., Ltd., and Leduc Leaseholds, Ltd., have assured success at a wildcat in an area that was not considered too good because of previous failures. The well, B-A-Leduc Leaseholds No. 1, LSD 16, 1-50-27w4, is about ¾ mile southwest of Leduc's current producing limits, closest producers being Continental Leduc No. 8 and Imperial No. 120.

Encouragement came when B-A-Leduc topped the D2 zone at 5,130 ft. and recovered 260 ft. of clean oil and 180 ft. of oily mud in a 1-hour test of interval 5,159-80 ft. Gas flow rate during this test was 88,000 cu. ft. daily. Coring was then continued and better porosity showed. A further drill-stem test was run of interval 5,179-5,200 ft. This gave a daily gas flow rate of 155,000 cu. ft. plus a 2,940-ft. rise of clean crude oil in 1 hour.

The D2 zone at B-A-Leduc Leaseholds showed at 5,130 ft., on elevation of 2,766 ft., only 6 ft. lower than Continental No. 8, D2 producer which rated an 1,800-bbl. per day initial open flow potential. Two miles due north of the new success is McConset-Leduc No. 1, which found D2 zone high enough for success but too tight to yield oil commercially. McConset is now heading on for D3 zone test.

Leduc Consolidated No. 2, LSD 15, 23-50-26w4, on the east edge of the D3 zone core of the Leduc field, now looks like it will be a much better oil well than when it first completed about a year ago. Leduc Consolidated redrilled its one and only oil well which turned to water when Atlantic No. 3 blew wild, and has tapped the D3 pay zone some 70 ft. higher than in the original hole, thus assuring success in this directionally drilled hole.

Sylvan Glen area.—R. I. Clancey from Toronto has joined forces with Imperial Oil, Ltd., for a drilling program in the Sylvan Glen area, 65 miles north of Edmonton. The well site is on a 37,745-acre Crown Reservation extending northeast from Jarvie, a point on the Northern Railway line about midway between Edmonton and Smith. Imperial had carried out a seismograph survey, under an agreement whereby, if seismic results warranted exploratory drilling, Clancey and Imperial would share equally in costs and any benefits. Drilling will get under way immediately, as the geophysical phase has been found favorable.

St. Paul.—Six independent companies from eastern Canada have commenced a five-well exploratory drilling program in the St. Paul area of central east Alberta, on Crown Reservation lands totaling 180,000 acres. Backers of the program include Shaw Petroleum Corp. of Canada, High-Malartic Gold Mines, Citralam-Malartic Gold Mines, Lingnora Gold Mines, New Pacalta Oils, and Bristol Oils. The first well, St. Edouard No. 1, LSD 13, 10-58-8w4, is about 6 miles due east of St. Paul, and is currently drilling below 1,800 ft. Second well will be drilled several miles to the southeast, while the third and fourth will likely be some distance to the northwest. A fifth well, which location will be set by results of the first four, will go into the Devonian for a thorough test of its possibilities.

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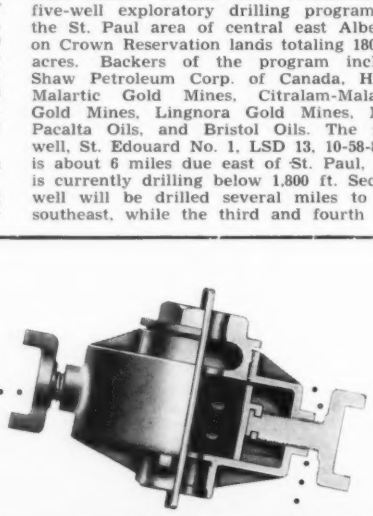

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OHIO, KENTUCKY

Foraker Gets Two Successful Tests

COLUMBUS.—The Foraker Drilling Co. made two rich oil strikes, one a ½-mile extension and the other a new pool opener. The extension was to the east of the Tropic pool on 1-C Harry Gibbs, Section 35 W., York Township, Morgan County. Clinton sand at 3,846-82 ft. filled up the hole with 2,000 ft. of oil, natural, and in 24 hours after a 90-qt. shot, flowed 132 bbl. Pay sand was the bottom 10 ft. and the oil graded Pennsylvania.

The pool opener was the 1 F. C. Henderson, Section 18, Hopewell Township, Perry County. Twenty-two feet of hard, fine Clinton was found near 2,800 ft. with the best pay in the lower half. The well filled up 600 ft. overnight and was shot with 60 qt. and within an hour started to flow. The first 24-hour test showed 86 bbl. of as yet an undetermined grade of oil.

The largest open-flow gasser yet found in the old Boliver pool was brought in by Natural Gas Co. of West Virginia on 2 Raymond Lab, Lot 65, Lawrence Township, Tuscarawas County. The white Clinton was topped at 4,548 ft. and started to pay at 2 ft. in. When finished at 4,567 ft. and still in sand, the gage was 4,257,000 cu. ft. of gas.

The third and largest well of the new East Elyria pool was drilled in by E. S. Wolfe on 1 C. A. Summers, Lot 11, Elyria Township, Lorain County. Clinton at 2,351-63 ft. gaged 2,280,000 cu. ft. of gas, natural.

The Mid-East Oil Co. 1-C Meltzer, Section 22, Jackson Township, Knox County, made 36 bbl. the first day after shot. The test is ½ mile from production and confirms the presence of an oil pool in the southeast part of the township.

OHIO SUCCESSFUL WILDCAT

Lorain County, Penfield Township: Ohio Fuel Gas Co. 1 E. L. Pierce, Lot 10, Clinton 2,438-56 ft., 407,000 cu. ft. of gas, TD 2,528 ft.

OHIO WILDCAT FAILURE

Tuscarawas County, Dover Township: East Ohio Gas Co. 1 O. & D. Specht, Sec. 10, Clinton 4,497-4,569 ft., dry, TD 4,675 ft.

WESTERN KENTUCKY

OWENSBORO.—The deep Webster County wildcat, Pure Oil Co., Ashland Oil & Refining Co., and I. B. Browning 1 M. L. Walker, 22-N-24, has found indications of deep oil accumulation in Western Kentucky. A 2-hour drill-stem test of the Kimswick lime (Ordovician) at 4,810-40 ft. had gas in 5 minutes and recovered 300 ft. of oil and gas-cut mud. About one-half of the recovery was clean oil and the balance was mud cut with gas. This well was started in June of this year, and is scheduled as a 7,500-ft. test. The hole was drilled to 1,710 ft. with rotary tools and about the middle of July the shift to cable tools was made to carry the drilling to 3,806 ft. In the latter part of November, operators changed back to rotary for the balance of the drilling.

In Daviess County, F. M. Ashby is pump testing the Palestine at 1 St. Peter Catholic Church land, 5-P-28, just east of Stanley, Ky. On last report, the well was making about 220 bbl. per day.

In the area west of Guffie pool in McLean County, Basin Drilling Co. and J. Kaufman have set casing for a test of the Hardinsburg at 2 B. R. Edwards, 23-N-27. A 1-hour drill-stem test at 1,335-42 ft. had gas in 25 minutes and recovered 175 ft. of oil and 35 ft. of oil-cut mud with no water.

WESTERN KENTUCKY WILDCAT FAILURES

Henderson County: George S. Ryan and Ray Ryan 1 K. McNeely, SW SE NE 23-Q-20, dry, TD 2,305 ft.

McLean County: Sohio Petroleum Co. and W. E. Hupp 1 J. C. Brown, SE NW SW 15-N-26, dry, TD 3,075 ft.

INDIANA

EVANSVILLE.—Daviess County has a prospective Devonian producer at Coy Oil Co. 1 Cecil V. Wildman, SE SW SE 21-2n-7w, about 5 miles south of Washington, Ill. Operator has set casing at total depth of 2,669 ft. after finding good oil saturation in the Rosiclare at 1,325-33 ft. and in the Devonian at 2,634-69 ft. About 20 ft. of the Devonian had excellent saturation and operator will perforate for tests before the end of the month. This well is located on the west side of Veale pool where production has been from the Cypress at about 920 ft., the Aux Vases at 1,153 ft., and the McClosky at 1,197 ft. If the Devonian proves to be commercially productive it will create much interest in deeper drilling in the area.

Rochester pool in Gibson County has had many good wells since it was opened in June. Within the past week, Ralph Halbert has completed 4 E. J. Lennert, SE NE SW 12-2s-13w, with an initial production of 225 bbl. per day from the Waltersburg at 1,880-1,921 ft. Also, Sharp & Ryan and Aurora Gasoline Co. 1 Berry et al, Section 14, made 500 bbl. per day from the Pennsylvanian at 1,284-1,338 ft.

In Sullivan County, A. S. Reed is pump testing the Devonian at 1 G. L. Bolinger et al, NE NE NE 19-9n-9w, between Marts and Shelburn pools.

INDIANA WILDCAT FAILURES

Cass County: Truman Drake 1 R. M. Bawyer, NE SW SW 1-26n-3e, dry, TD 1,005 ft.

Gibson County: W. E. Gass and T. J. O'Leary 1 G. C. and Nancy Robb, NW NW SW 12-2s-9w, dry, TD 1,699 ft.

N. V. Duncan and Walter Duncan 1 Mary E. Polk, SW SW SW 33-2s-13w, dry, TD 2,021 ft.

CALIFORNIA

Shell Oil Co. Makes Gas Discovery

LOS ANGELES.—Shell Oil Co. has completed its 3-1 Unit, 8-8n-1w, in the Pleasant Creek area of Yolo County, as a new gas discovery. Located about 8 miles northwest of the Winters gas field, which Shell discovered in 1946, the 3-1 Unit flowed gas at an estimated rate of 5,300,000 cu. ft. daily on a 1-hour formation test of the interval 2,784-2,820 ft. The well is now standing at total depth of 3,000 ft. with casing run preparatory to completion.

Production of R. W. Jerman's deep De Soto Zone discovery in the Signal Hill field, the 1 Victory, 24-4s-13w, is holding up extremely well with latest production gages indicating a flow of 461 bbl. daily through a ½-in. choke. Gravity of the oil tests 29°, and water cut is only 4 per cent. Previous wells drilled to the De Soto zone in the field have had considerable difficulty due to water and production has not been considered commercial. These former wells, however, are located across the main Signal Hill fault from the 1 Victory, which indicates that the new discovery may have tapped a fairly prolific reservoir. At any rate the success of the well has prompted the staking of locations for two additional tests to the zone. These are the Hancock Oil Co. 34 Signal and a test to be drilled by Warren L. Meeker. Both tests are to be located in 24-4s-13w. In spite of the outcome of these new tests, a rapid development is not expected due to the depths involved, 10,000 to 11,000 ft. This is too deep for town-lot development and also involves too much risk for the majority of the independents holding acreage in the area.

Field reports last week indicated that Standard Oil Co. of California definitely had logged oil saturation in the Eocene sand at its deep wildcat venture in the Greeley field of Kern County. The saturation is said to have been found in the interval 13,352-74 ft., and Standard currently is running casing to make a formation test. The well is known as the 12-21 Kern County Land Co., 7-29s-26e.

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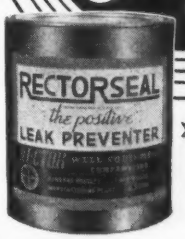

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CALIFORNIA SUCCESSFUL WILDCATS

Kern County, Devils Den area: Gilliland Oil Co. 1 Logan-Green, 10-25s-18e, pumped 30 bbl. daily, gravity 15.0°, water cut 80 per cent, elev. 668 ft., TD 650 ft.

Gosford area: Hancock Oil Co. of Calif. 85-23 K.C.L., 23-30s-26e, flowed 215 bbl. daily through 5/16-in. choke, gravity 33°, water cut 1 per cent, perf. 7,839-54 ft., elev. 346 ft., TD 8,437 ft.

Mountain View area: Hogan Petroleum Co. 6 Symons-Bankline, 4-31s-29e, flowed 25 bbl. in 6 hr., gravity 32°, water cut 50 per cent, perf. 5,947-56 ft., 5,912-40 ft., 5,848-63 ft., elev. 458 ft., TD 6,967 ft.

Los Angeles County, Aliso Canyon area: Standard Oil Co. of Calif. 1-6 Frew, 29-3n-16w, completed on gas lift for 106 bbl in 8 hr., gravity 20.7°, water cut 0.8 per cent, elev. 2,135 ft., perf. 8,585-8,752 ft., TD 8,758 ft.

CALIFORNIA WILDCAT FAILURES

Kern County, Ant Hill area: J. A. Smith 1 Southern Pacific, 31-29s-30e, dry, elev. unknown, TD 577 ft.

Blackwells Corner area: British-American Oil Producing Co. et al 85-21 Beer, 21-26s-19e, dry, elev. 512 ft., TD 6,542 ft.

Kern Bluff area: Oceanic Oil Co. 1 McMahon, 8-29s-29e, dry in gray silt, elev. 769 ft., TD 783 ft.

Los Angeles County, Leffingwell area: Hathaway Oil Co. 1 La Mirada, 10-3s-11w, dry, elev. 205 ft., TD 5,830 ft.

Monterey County, San Ardo area: Barnsdall Oil Co. 1 P. W. & P., 29-23s-11e, dry, elev. 851 ft., Campbell 2,900 ft., basement 4,088 ft., TD 4,151 ft.

Santa Barbara County, Casmalia area: Union Oil Co. 2 Jesus Maria, 34-8n-35w, dry, elev. 431 ft., TD 1,664 ft.

Cuyama Valley area: Cuyama Trust Syndicate 1 Marilyn, 25-11n-28w, dry, elev. unknown, TD 5,960 ft.

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Tulare County, Ducor area: R. E. Trout 1 Veach, 13-24s-27e, dry, elev. 660 ft., TD 1,929 ft.

ILLINOIS

Wayne County Wildcat Makes 92 Bbl. Daily

MATTOON.—Gulf Refining Co. has completed 1 W. S. Rush, NE NE NE 35-2n-5e, to open a new pool about 2½ miles southwest of Wayne City in Wayne County. The well was completed in the McClosky at 2,964-68 ft. with an initial pumping production of 92 bbl. per day. Total depth is 2,981 ft.

In Jefferson County, H. E. Howard 1 A. R. McLaughlin, NW SE SW 2-3s-2e, is going on pump for further tests of the McClosky at 2,715-40 ft. and 2,754-57 ft. The well swabbed at the rate of about 25 bbl. of oil per day but was making considerable water.

Sohio Petroleum Co. 1 Everett Lomas, SW NW SW 5-1n-10e, Edwards County, is cleaning out and testing the McClosky at 3,248-54 ft. and 3,257-60 ft. The well is between Maple Grove and Bennington pools.

In the Omaha pool area of Gallatin County, Hubert Keasler is testing the Cypress at 1 Duckworth, NW SW NW 33-7s-8e, about 7 miles south of Norris City.

The north edge of East Dundas pool in Jasper County has a good well at J. M. Miller 1 Roy Semple, NE NE SW 14-5n-10e. Well was completed in the Rosiclare at 2,908-18 ft. with an initial production of 615 bbl. per day.

The northwest part of Centralia pool in Clinton County had two good Trenton pay completions last week. Sohio Petroleum Co. 35 Copple, SE NW SW 35-2n-1w, was completed with an initial production of 168 bbl. per day from pay at 3,930-4,035 ft. J. M. Powell et al 1 Ratts, SE SW NW of the same section, made 150 bbl. per day.

ILLINOIS SUCCESSFUL WILDCAT

Christian County: National Associated Petroleum Co. 1 J. H. Lawrence, SE NE SE 9-13n-1e, IP 116 bbl., Devonian 2,296-2,310 ft., TD 2,310 ft.

ILLINOIS WILDCAT FAILURES

Christian County: National Associated Petroleum Co. 1-B Peabody Coal Co., SE SE SE 33-13n-3w, dry, TD 2,606 ft.

National Associated Petroleum Co. 1 Peabody Coal Co., NW SE SW 32-13n-3w, dry, TD 2,618 ft.

Gallatin County: C. E. Skiles 1 Abyah Allyn, NE NW NE 29-7s-9e, dry, TD 3,100 ft.

Ashland Oil & Refining Co. et al 1 D. J. Maloney, SE SE SW 25-8s-9e, dry, TD 2,943 ft.

Jackson County: Burr-Lambert 1 Hogles, SE NW SW 28-10s-2w, dry, TD 2,565 ft.

Jasper County: L. F. Jordan 1 J. Miller, SW NE SW 9-5n-14w, dry, TD 2,883 ft.

Macoupin County: T. W. McLaughlin 1 F. Flanders, SW SE SW 26-7n-6w, dry, TD 600 ft.

Madison County: J. W. Gerhardt 1 Petus, NE NE SE 14-6n-7w, dry, TD 620 ft.

Franklin County: Arvil Drilling Co. 1 U. S. Coal & Coke Co., SW SW NE 28-6s-4e, dry, TD 3,222 ft.

Hamilton County: Eason Oil Co. 1 Walgrove, SE SE SW 10-4s-6e, dry, TD 3,542 ft.

Richland County: B. F. Smith et al 1 A. Zimmerly, NE NE NE 18-4n-14w, dry, TD 3,188 ft.

Jack Stapp 1 Hanaway, SW SW NE 26-5n-9e, dry, TD 3,094 ft.

Shelby County: George & Wrather 1 William Young, SW SW NE 24-10n-6e, dry, TD 2,263 ft.

Wayne County: C. E. Skiles 1 Talbert, SE SE NE 6-2s-8e, dry, TD 3,293 ft.

White County: Ashland Oil & Refining Co. 1 Westergard et al, SE NW SW 29-6s-11e, dry, TD 3,008 ft.

LA.-ARK.

Bienville Parish Gets Gas Prospect

SHREVEPORT.—Placid Oil Co. 1 Bienville Lumber Co., 9-14n-7w, 9 miles west of Saline in Bienville Parish, apparently had the salt water sealed off and was showing for some kind of a gas discovery. No report was made on distillate recovery, if any. Testing the Travis Peak at 7,734-42 ft., using ⅜-in. choke and 1,000 ft. of water cushion, the well flowed the water cushion, then salt water for 2 hours. Operators squeezed and reperforated at 7,626-32 ft. A drill-stem test with packer at 7,600 ft. recovered the water blanket, then started flowing gas at the rate of 1,000,000 cu. ft. daily.

Five miles southeast of the Saline Lake field, Hunt Oil Co. 5 Louisiana Delta, 23-4n-5e, was awaiting standard tools to test the Wilcox. On last report, it swabbed salt water with a slight show of oil and gas at 5,834-40 ft., then squeezed. After drilling out to 5,850 ft., it swabbed 4 bbl. of oil an hour. Total depth was 10,650 ft., plugged back to 6,080 ft.

In Claiborne Parish, Hunt Oil Co. 1 Smith, 10-23n-7w, north of the East Haynesville field, was preparing to run casing around 5,065 ft. In 34-20n-5w, H. W. Klein 1 Sims was drilling Travis Peak at 6,318 ft.

Hunt's 1 W. A. J. Peevy, 10,000-ft. Cotton Valley wildcat in 32-15n-3w, Jackson Parish, was coring in the lower Glen Rose below 9,580 ft. In Lincoln Parish, Southwest Gas Producing Co. 1 Burgess, 8-20n-4w, was drilling in the Travis Peak at 6,694 ft. The California Co. 1 Brown Paper Mill, 10-16n-3e, Ouachita Parish, was in the Travis Peak at 7,590 ft. Sample top on that zone was 6,000 ft., on elevation of 106 ft. T. L. James & Co. 2 Ida Mae Wade, 7-22n-1w, Union Parish, was drilling Travis Peak at 5,635 ft. Contract depth was 6,000 ft.

In Webster Parish, Barnsdall Oil Co. 1 Sykes, 1-22n-9w, apparently did not test at 9,584 and 9,565 ft., where side-wall cores had slight shows of oil, but plugged back to 5,717 ft. to test the Pettit (corrected from last week).

Lion Oil Co. 1 Story, Columbia County, Arkansas, had a show of oil in cuttings at 6,914-25 ft., in the Cotton Valley, but mechanical difficulties prevented a drill-stem test and it continued drilling below 7,328 ft.

In Drew County, C. G. Davis 1 Charlie Lukus, 2-12s-5w, was fishing drill collars at 4,620 ft., total depth. North of Stamps, McAlester Fuel Co. 1-A Tatum, 23-15s-23w, Lafayette County, was in the lower Glen Rose at 3,680 ft. Drillers' top placed the Massive anhydrite at 3,460 ft. South of Prescott, McAlester's 1-A Ira Kizer, new Cotton Valley wildcat in 15-12s-22w, Nevada County, was drilling below 2,557 ft. in the Glen Rose.

NORTH LOUISIANA WILDCAT FAILURES

Catahoula Parish: J. H. Williams 1 W. Z. Kirkland, NW NW 36-9n-6e, dry, TD 6,002 ft., Wilcox 3,106 ft., Midway 5,754 ft., elev. 63 ft.

Union Parish: C. M. Bagley 1 L. R. Black, 4-23n-1w, dry, TD 2,302 ft.

Shell Oil Co., Inc., 1 Hugh Barron, 7-23n-2w, dry, TD 3,518 ft.

Purchase of Doheny Land Considered by Tide Water

Stockholders of Tide Water Associated Oil Co. will be asked at a meeting in New York City, December 20, to take action on a proposal to purchase from Mrs. Carrie Estell Doheny her approximately one-quarter interest in oil lands and leases in Coalinga, Pleasant Valley, and Guijarral Hills oil fields in Fresno County, Calif., at total price of $43,000,000.

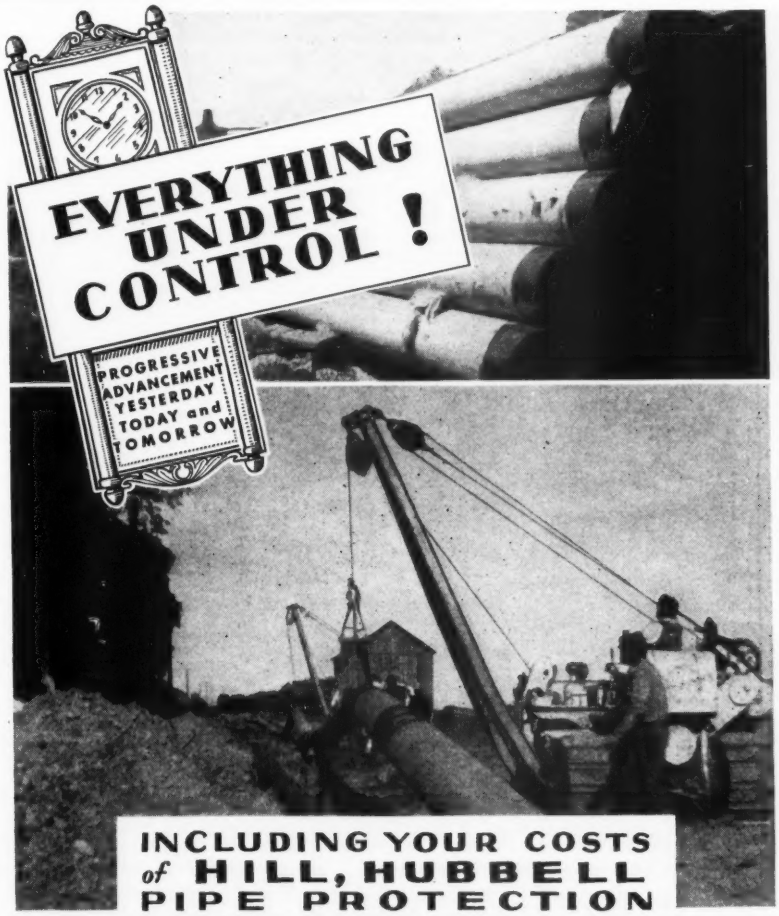
At present there are 64 wells on Coalinga leases which in the first 10 months of 1948 produced 8,517,989 bbl. of crude.

Texas Land Board Gets Bids on 79,135 Acres

HOUSTON.—A total of 303 high bids offering $2,141,687 for mineral leases on 79,135 acres of public school land was announced by the School Land Board recently.

Highest of the bids was $140,733.25 for a 685-acre tract in Laguna Madre, Kenedy County, by Sun Oil Co. Sun also bid high on adjoining tracts, offering $108,683.05 on 529 acres and $96,416 on 640 acres. However, lease sale by the state of more than 12,000 acres in Laguna Madre was blocked last week by a temporary restraining order granted in 98th district court.

Nine property owners in Kleberg and Kenedy counties protested the sale alleging that title in the submerged property was awarded to the private owners by previous court action. Bascom Giles, state land com-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missioner, accepted bids on the acreage at the state lease sale, but is withholding awarding the bids pending disposition of the suit.

Cabot Carbon Co. made the highest per-acre bid with an offer of $101,315.11 on 140 acres in Crane County. This tract is located within 1,000 ft. of oil production and seven competing bids were received. Brazos Oil & Gas Co. bid $90,813 and $40,154 respectively for 771-acre and 926-acre tracts in Powder Horn Lake, Calhoun County.

Final action on all bids made in the sale will be delayed until all bids have been checked for correct description and other legal requirements.

Survey Shows Trends in Oil Industry Research

THE petroleum industry as a whole is spending about half of its research efforts on improving present products and processes, and about 60 per cent of it has short-range objectives, it is indicated in a survey of a large group of industries just completed by Evans Research & Development Corp., New York.

To determine the present status and trends in industrial research the survey asked 10 questions of 2,467 business executives and research directors in a wide cross-section of industry. The following tabulation compares the answers received from the petroleum industry with the total for all corporations replying:

1. How much do you anticipate the recently approved government preparedness program will affect your normal research and development activities?

	Petroleum (%)	All industries (%)
Appreciably	18	6
Slightly	43	51
Not at all	39	43

2. Of the total time your company spends on research, what percentage would you say is devoted to:

Improvement of present products or processes?	50	48
Development of new products or processes in your own field?	37	39
Development of new products or processes in other fields?	12	18
Government contract research?	7	13
Development of new products or processes relative to the rearmament program?	10	8

3. For the coming months, at least, do you expect to continue all your present research activities without interruption?

Yes	90	94
No	10	6

4. How does the time spent by your company on long-range research compare to that spent on short-range?

Long range	40	38
Short range	60	62

5. During the past year did your company use the services of an outside research organization?

Yes	46	53
Commercal	23	30
Endowed	23	23
No	54	47

6. In your opinion, will the impact of new military demands coupled with other conditions create a shortage of research personnel experienced in your field?

Yes	46	37
No	54	63

7. Are your present facilities, such as personnel, space, and equipment, fluid enough to accommodate new or additional research without causing congestion?

Yes	45	57
No	55	43

8. What about your company's research appropriations for the next 12 months; will your budget?

Increase	33	36
Decrease	0	3
Remain the same	67	61

9. If an increase is planned, is it based on the rearmament program, an expansion of your present business activities, or both?

Rearmament	0	1
Business	54	79
Both	46	20

10. In conclusion, if your research activities are increased will you?

Expand your own facilities	63	54
Use outside research organization	0	5
Perhaps do both	37	41

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Well Completions in November Up 14.7 Per Cent Over 1947

by Polly De Armond

TOTAL well completions in November increased 14.7 per cent over November last year, a gain of 441 wells, for a total of 3,431. The increase was made up of 410 oil wells and 101 dry holes, partly offset by a decrease of 70 gas wells. Total footage at 11.8 million feet as compared to 10.4 million feet in the same month last year, was up 13.6 per cent.

Comparisons by areas indicate that the Pacific Coast produced the greatest percentage gain in completions with 39.4 more wells drilled during November 1948 than in November 1947. The area also noted a 29.6 per cent gain in footage. The Mid-Continent area (Kansas and Oklahoma) completed 28.7 per cent more wells and drilled 44.2 per cent more footage. The Rocky Mountain region, comprised of Montana, Wyoming, Colorado and Utah, represented a 28 per cent increase in completions and a 36.3 per cent increase in footage, while Texas and New Mexico gained 20.5 per cent in wells and 16.2 per cent in footage.

New York, Pennsylvania and West Virginia completions rose 5 per cent and footage was up 3.6 per cent over the same month of the previous year. The North Central states of Ohio, Indiana, Kentucky, Illinois and Michigan increased 4.3 per cent in wells but declined 3.2 per cent in footage drilled. Only one area reported decreases in both categories: the Southern states, including Louisiana, Arkansas, Alabama, Georgia, Florida, Mississippi and Tennessee, were down 11.2 per cent in completions and 16.6 per cent in footage.

Cumulative Comparisons

Completions for 11 months of 1948 compared with the same period of 1947 increased 5,522 wells or 18.1 per cent, with the same percentage for footage, up 19,023,803 ft. The western areas paced these gains for the cumulative periods, with the Rocky Mountain region up 44.2 per cent in completions and 56.4 per cent in footage, and Pacific Coast up 39.9 per cent in wells and 19.5 per cent in footage.

The Texas-New Mexico area increased 27 per cent in wells completed and 24.5 per cent in footage drilled from January through November. The Southern states reported a gain of 23.1 per cent in wells and 5.6 per cent in footage. In the North Central district, completions rose 18 per cent and footage was up 13.5 per cent. The Mid-Continent division showed a 14.4 per cent gain in wells with a 23.3 per cent gain in footage. The Eastern area noted the only decreases for the period with a 6 per cent drop in wells and an 8.6 per cent decline in footage.

Rigs and Drilling Record

A new all-time high, and the second consecutive record, was established for the rigs and drilling figure, with 5,144 active rigs reported for the nation as of December 1.

SUMMARY OF COMPLETIONS, NOVEMBER 1948

	Total comp.	Oil	Initial prod.	Gas	Dry	Under 2,500 ft.	2,500-5,000 ft.	5,000-7,500 ft.	7,500-10,000 ft.	Over 10,000 ft.	Total footage	Rigs and drilling
New York	118	59	124	0	59	118	0	0	0	0	170,328	143
Pennsylvania	290	147	323	16	127	279	11	0	0	0	450,417	265
West Virginia	73	16	352	39	18	37	31	4	1	0	200,645	189
Ohio	116	32	513	32	52	71	43	2	0	0	245,161	200
Indiana	110	43	3,624	0	67	91	19	0	0	0	206,546	127
Kentucky	94	36	1,962	23	35	66	28	0	0	0	160,049	42
Illinois	213	111	12,197	1	101	71	142	0	0	0	551,668	301
Michigan	95	42	6,810	2	51	59	36	0	0	0	213,459	143
Kansas	281	153	72,843	24	104	31	248	2	0	0	912,604	412
Neb., Mo., Iowa	0	0	0	0	0	0	0	0	0	0	0	10
Oklahoma	375	236	24,498	14	125	127	160	69	13	6	1,431,296	668
Texas	1,022	656	99,558	49	317	254	429	202	114	23	4,412,921	1,378
North	182	104	9,453	0	78	101	53	28	0	0	500,699	244
West Central	145	83	11,194	3	59	34	105	6	0	0	457,549	161
West	245	212	55,042	1	32	43	116	46	36	4	1,153,997	235
Panhandle	61	37	2,350	18	6	4	56	0	0	1	194,983	170
Eastern	51	27	3,336	7	17	7	22	12	8	2	263,772	101
Gulf Coast	173	104	10,721	9	60	6	43	57	55	12	1,129,338	250
Southwest	165	89	7,462	11	65	59	34	53	15	4	712,583	217
Louisiana	164	104	11,719	11	49	61	24	14	33	32	930,491	288
Northern	97	62	4,534	10	25	61	19	12	3	2	290,207	104
Southern	67	42	7,185	1	24	0	5	2	30	30	640,284	184
Arkansas	22	10	1,041	0	12	5	9	3	4	1	97,242	39
Mississippi	31	21	3,282	0	10	1	2	17	4	7	221,220	46
Ala., Ga., Fla.	6	0	0	0	6	0	3	2	1	0	32,103	9
Tennessee	14	2	150	1	11	14	0	0	0	0	14,082	9
Montana	36	26	1,850	4	6	21	13	2	0	0	90,554	71
Wyoming	70	45	8,597	0	25	4	45	15	4	2	324,140	227
Colorado-Utah	13	8	741	0	5	7	0	6	0	0	45,349	69
New Mexico	44	27	3,661	4	13	7	26	8	3	0	180,745	134
California	§244	194	31,469	0	§50	§91	101	30	14	8	896,297	374
Total November 1948	3,431	†1,968	285,314	220	*1,243	1,415	1,370	376	191	79	11,787,317	‡5,144
Total October 1948	3,694	2,027	347,733	275	1,392	1,528	1,522	381	185	78	12,596,963	5,105
Total November 1947	2,990	1,558	245,989	290	1,142	1,304	1,103	490		93	10,373,725	4,516
Cum. 11 months 1948	35,992	20,499	3,054,833	2,577	12,916	14,364	14,705	6,070		853	123,880,339	....
Cum. 11 months 1947	30,470	16,574	2,920,576	3,050	10,846	13,090	11,571	5,056		753	104,856,536	....

*Incl. 196 service wells: N. Y. 59, Pa. 121, Ohio 6, Mich. 4, Kans. 4, Okla. 2. †Incl. 20 condensate wells: Okla. 1, No. Cen. Tex. 2, E. Tex. 2, Tex. Gulf 5, S.W. Tex. 1, No. La. 2, So. La. 5, Miss. 2. ‡Incl. all wells rigged up and/or drilling at end of month. §Incl. Wash. 1.

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 25, 1948

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1948				
	Comp.	Oil	Gas	Dry	Footage	1948	1947	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	23	12	0	*11	21,783	1,454	1,746	0	0	0	0	0	0	0	0	0	0
Pennsylvania	40	20	2	†18	69,521	2,493	3,122	0	0	0	0	0	0	0	9	14	23
West Virginia	10	3	7	0	25,826	812	858	0	0	0	0	0	3	0	27	43	83
Ohio	32	14	6	‡12	75,896	1,394	1,361	0	0	1	1	2	2	0	12	37	51
Indiana	25	11	2	12	41,892	1,114	652	0	0	0	3	3	28	0	1	106	135
Kentucky	21	9	4	8	39,084	795	751	0	0	0	2	2	10	0	0	43	53
Illinois	51	25	0	26	137,382	2,492	2,083	1	0	0	15	16	50	0	2	390	442
Michigan	19	6	0	13	40,736	879	899	0	0	0	10	10	21	0	10	271	302
Kansas	89	44	8	§37	282,370	3,149	2,714	1	0	0	12	13	63	0	8	437	508
Neb., Mo., Iowa	0	0	0	0	0	9	7	0	0	0	0	0	0	0	0	7	7
Oklahoma	100	56	3	§41	410,000	4,180	4,001	4	2	0	14	20	130	10	29	625	794
Texas	223	141	20	62	1,016,020	11,990	9,130	5	1	2	37	45	330	38	102	2,045	2,515
North Central (Dist. 7-B & 9)	55	33	0	22	162,525	3,760	2,820	0	0	0	9	9	121	3	13	741	878
West (Dist. 7-C & 8)	73	59	0	14	391,015	3,191	2,250	3	0	0	8	11	69	1	6	237	313
Panhandle (Dist. 10)	13	5	8	0	37,599	655	481	0	0	0	0	0	1	0	3	11	15
Eastern (Dist. 5 & 6)	12	10	1	1	51,049	609	577	0	0	0	1	1	12	2	1	121	136
Gulf Coast (Dist. 2 & 3)	27	13	6	8	177,288	1,860	1,548	0	1	1	6	8	73	27	38	430	568
Southwest (Dist. 1 & 4)	43	21	5	17	196,544	1,915	1,454	2	0	1	13	16	54	5	41	505	605
Louisiana	32	19	1	12	196,556	2,287	1,621	1	0	0	5	6	51	28	9	220	308
Northern	16	10	0	6	42,891	1,520	970	0	0	0	3	3	4	6	2	107	119
Southern	16	9	1	6	153,665	767	651	1	0	0	2	3	47	22	7	113	189
Arkansas	7	4	0	3	40,720	309	327	0	0	0	0	0	6	0	0	94	100
Mississippi	5	4	0	1	38,140	415	481	0	0	0	1	1	4	2	3	102	111
Southeastern States	0	0	0	0	0	53	64	0	0	0	0	0	0	0	0	48	48
Montana	1	1	0	0	2,015	309	308	0	0	0	0	0	5	0	0	28	33
Wyoming	20	12	1	7	89,644	591	266	0	0	1	2	3	26	0	3	78	107
Colorado-Utah	10	3	1	6	42,111	225	212	0	0	1	6	7	3	0	6	52	61
New Mexico	14	9	1	4	79,269	595	548	1	0	0	2	3	6	1	3	59	69
California	54	44	0	10	214,544	2,826	2,026	4	0	0	8	12	120	1	5	346	472
Total United States	776	437	56	283	2,862,599	38,371	33,177	17	3	5	118	143	858	80	239	5,045	6,222
Total previous week	787	449	56	282	2,695,068	37,595	32,520	15	4	2	103	124	841	77	234	4,927	6,079
Total December 27, 1947	657	354	41	262	2,128,008			7	0	4	66	77	682	88	226	4,109	5,105

Service wells included: *11, †18, ‡3, §1.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$2.17	....	....	....
19-19.9	2.19	....	....	....
20-20.9	2.21	$2.25	....	$2.12
21-21.9	2.23	2.27	....	2.14
22-22.9	2.27	2.29	....	2.16
23-23.9	2.30	2.31	....	2.18
24-24.9	2.34	2.33	$2.56	2.20
25-25.9	2.38	2.35	2.58	2.22
26-26.9	2.41	2.37	2.60	2.24
27-27.9	2.45	2.39	2.62	2.26
28-28.9	2.49	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.56	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.62	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point. †Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. (For detailed price changes in all fields see The Oil and Gas Journal, January 1, 1948, page 107.)

A.P.I. REFINERY REPORT, WEEK ENDED DECEMBER 18

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Production: Kerosine	Production: Gas & dist. oil	Production: Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	874	2,299	302	1,606	1,664	22,932	10,908	26,384	12,950
Appalachian:									
District 1	103	312	58	91	86	2,457	392	1,025	437
District 2	71	238	34	50	115	1,160	121	269	246
Ind., Ill., Ky.	945	3,364	509	1,036	1,121	20,170	4,535	12,045	5,596
Okla., Kans., Mo.	440	1,615	213	512	553	9,356	1,381	5,703	2,918
Inland Texas	250	1,123	88	174	400	3,569	619	895	1,139
Texas Gulf Coast	1,453	4,343	740	2,311	1,791	16,209	3,429	13,906	11,532
La. Gulf Coast	451	1,437	405	626	543	5,720	2,436	3,905	3,912
N. La. and Ark.	87	240	61	82	125	2,512	438	888	304
Rocky Mountain:									
New Mexico	15	54	7	12	27	73	25	53	30
Other Rocky Mtn.	151	509	38	160	227	2,249	230	1,589	1,076
California	855	2,368	82	879	2,401	11,818	828	14,409	47,077
Dec. 18, 1948	5,695	17,902	2,537	7,539	9,053	98,225	25,342	81,071	87,217
Dec. 11, 1948	5,650	18,395	2,506	7,553	8,946	97,110	25,512	82,406	86,641
Dec. 20, 1947	5,246	16,006	2,291	6,250	8,643	87,056	16,866	51,502	52,113

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 237,735,000 bbl. as of December 11—up 3,803,000 bbl. One year ago 223,474,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.	
East Texas‡	$2.65
Kettleman Hills, California*	2.14
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	4.50
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 25 crude oil	B. of M. Dec. demand	Dec. 18 crude oil
Alabama	1,200	1,700	1,150
Arkansas	81,750	88,000	81,400
California	956,200	960,000	955,300
Colorado	*56,740	50,000	53,510
Eastern	63,000	65,500	61,800
Florida	850	1,100	850
Illinois	177,200	168,000	181,100
Indiana	23,000	20,000	24,500
Kansas	306,400	304,000	307,150
Kentucky	23,900	23,000	24,000
Louisiana	495,300	496,000	494,300
North Louisiana	116,300	.....	115,300
South Louisiana	379,000	.....	379,000
Michigan	45,100	45,000	46,100
Mississippi	123,000	131,000	128,750
Montana	25,790	26,000	25,800
Nebraska	350	700	350
New Mexico	134,490	132,000	134,490
Oklahoma	448,300	432,000	441,300
Texas	2,515,675	2,450,000	2,515,675
Dist. 1 (Southwest)	27,935	.....	27,935
Dist. 2 (Southwest)	179,150	.....	179,150
Dist. 4 (Southwest)	250,200	.....	250,200
Dist. 3 (Gulf Coast)	503,090	.....	503,090
Dist. 5 (Eastern)	51,725	.....	51,725
Dist. 6 (Eastern)	124,875	.....	124,875
East Texas Field	289,000	.....	289,000
Dist. 7-C (West)	50,425	.....	50,425
Dist. 8 (West)	743,225	.....	743,225
Dist. 7-B (W. Central)	62,350	.....	62,350
Dist. 9 (N. Central)	144,600	.....	144,600
Dist. 10 (Panhandle)	89,100	.....	89,100
Wyoming	155,530	146,000	154,520
Total United States	†5,633,775	5,540,000	5,632,045

Change from prev. wk., up 1,730

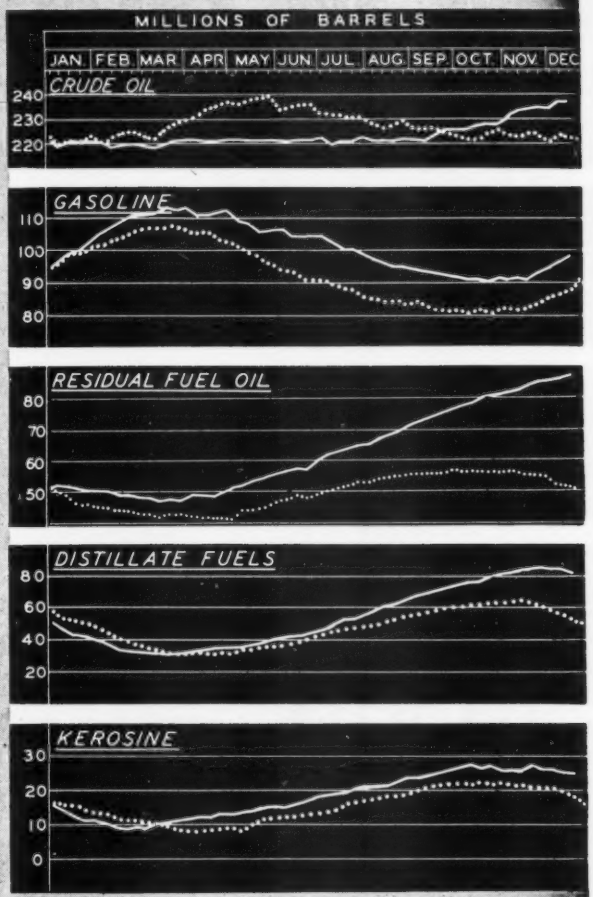
Total production January 1-December 25 ‡1,989,942,580 bbl.

Same period last year (crude plus cond.) 1,825,483,415 bbl.

*Incl. 160 bbl. Utah production. †Not incl. 76,855 bbl. condensate. ‡Incl. 26,930,240 bbl. condensate.

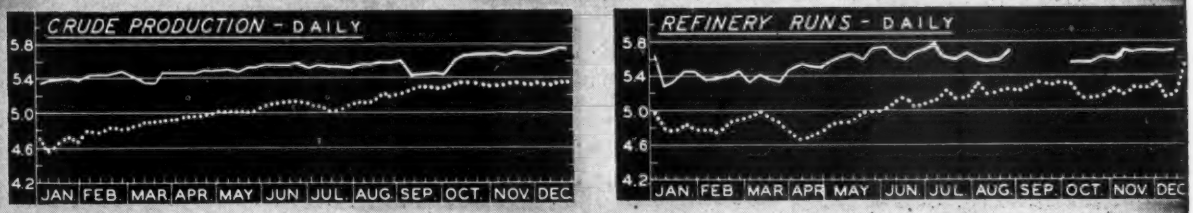
STOCKS IN UNITED STATES

---- 1947 ——— 1948



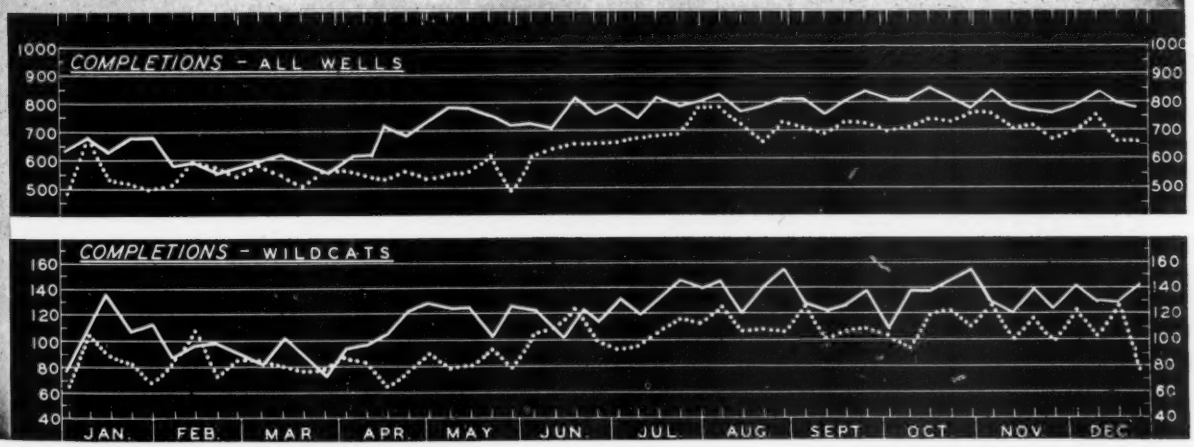
DAILY OPERATIONS

---- 1947 ——— 1948



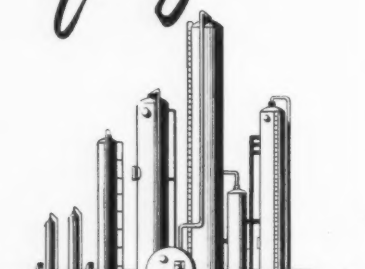
WEEKLY COMPLETIONS

---- 1947 ——— 1948



Markets

for your



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MARKETS

EVIDENCE of closer balance in the supply-demand situation of the petroleum industry was further strengthened last week with the price reductions as announced by Esso Standard Oil Co. High inventories in most areas continued to be felt marketwise, while generally unseasonable weather offered little relief to increasing stock levels.

Atlantic Seaboard

Esso Standard Oil Co., leading marketing organization in a large part of the East Coast area, last week announced its second reduction in the price of heavy fuel oil in a month. The company cut heavy fuel prices 25 cents per barrel effective December 23, and indications at the end of the week were that practically all other major suppliers would follow the reduction. New No. 6 price as posted by Esso at New York Harbor is $2.55 a barrel, and at the Gulf $2.

Together with reductions announced late in November, Esso Standard's latest cut in heavy fuel prices brings the total drop to 45 cents. Also effective December 23, the company reduced diesel fuels 1/5 cent at the tank-car level and increased wholesale gasoline prices ½ cent.

In its announcement, the company said: "The new price schedules are moves, following almost 2 years of extremely tight supply, toward a more normal price relationship between the products affected, and while the current adjustments represent some increases and some decreases, the over-all effect is a substantial reduction in the total income of the company and its affiliates."

The diesel reduction was at the tank-car level only and results in a differential over heating oil of ½ cent a gallon for automotive grades of diesel and 4/10 cent for industrial grades. The gasoline price increase was effective at all levels of wholesale distribution.

Following Esso's price adjustments Atlantic Refining Co. announced across-the-board reductions in heavy fuel oil prices of approximately 25 cents per barrel. Tank car quotations for Bunker type was cut from $2.80 per barrel to $2.55 and No. 6 from $2.85 to $2.60. Gasoline prices remained unchanged.

High stocks at secondary levels were said to be slowing trading in the open market at New York Harbor as most terminal operators were holding off purchasing. Barges of No. 2 oil were reported easily available at 9 cents and kerosine at 10.2 cents per gallon.

Mid-Continent

In the Mid-Continent area spot-market trading continued relatively sluggish. High stock levels of burning oils remained a problem to some refiners as several were reported moderating their operations.

One refiner in Kansas was said to have indicated that he would shut down his plant entirely if the downward trend in products prices continued. One North Texas refiner, who was said to have cut down runs because of high stock levels last week, said that further reductions in runs to stills would be necessary if the market did not pick up.

In the Chicago area many of the independent distributors of fuel oils, who have for some time maintained prices above those posted by major companies have reduced their tank-wagon prices on light grades of fuel oil by about ½ cent.

Representative Quotations

Representative spot-market quotations of leading suppliers as of December 27, 1948. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	10¼-10½	11.8-12* 10.5-11.9†	10¼-11½
Premium gasoline, 78-80 octane	11-11¼	10.6-13.4	11-12¼
42-44 w.w. kerosine	9⅜-9¾	10.3-	9½-10¼
No. 2 straw fuel oil	8½-9	9.1-	9- 9½
No. 6 residual	$1.60 1.75	$2.83-2.90	$2.20-2.52

*Branded (74-76 octane); †Unbranded (74-76 octane)

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	8½	8	8¼
Grade 18-55	10.2	9.6	9.9

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	12-13.5
750 vis., No. 3-4 neutral	15-16.5
2,000 No. 5-6 neutral	17-18.5

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	27
200 vis. No. 3 neutral, 0-10 pp.	17

Western Pennsylvania

144-155 vis. 10 p.t. bright stock	30.5-40.5
180 vis. p.t. neutral	29.5-38.5

CRUDE-SCALE WAX

Mid-Continent

132-134 A.M.P.	5½

EQUIPMENT MEN ... in the News

Younger Will Manage Office for Wolverine

A. M. YOUNGER

L. G. FOX

Wolverine Tube division of Calumet & Hecla Consolidated Copper Co. has appointed A. M. Younger, formerly general manager for Atlas Mineral Products Co., as manager of Southwestern sales. He will headquarter in the company's office in Houston. Younger succeeds L. G. Fox, who has developed Wolverine operations in the southwest territory. Fox has returned to the company's Detroit office to assume special assignment duties.

Another member of the Wolverine organization, J. L. Young, Jr., will headquarter in the Houston office also and with A. S. Williams, who headquarters in Dallas, will represent the company in Texas, Oklahoma, Arkansas, and Louisiana. Young comes to the company from the Kelly-Springfield Tire Co.

Robert L. Henry Joins Elliott Tulsa Office

Robert L. Henry has joined the Tulsa office of Elliott Co., Jeannette, Pa., as sales engineer. A holder of B.S. and M.E. degrees from Ohio State University, Henry came with Elliott Co. in 1942, following graduation. For the past 6 years he has served as an application engineer in the blower department.

Houston Company Begins Large Expansion Program

Houston Oil Field Material Co. is planning a $100,000 expansion program at its plant located at 300 South Wayside Drive, Houston. The project includes three large office and warehouse buildings.

Measuring 200 by 125 ft., the office building will be two stories in height and will also include a basement. Construction will be of brick veneer and frame with builtup roof. It will be completely air conditioned.

Another building, of masonery construction, 80 by 220 ft., will contain both office and warehouse space. The office section in this building will also be air conditioned.

A third building will provide display rooms and more warehouse space. This one-story building will be brick-veneer and frame construction.

Security Engineering Appoints De Jarnett

F. DE JARNETT

R. M. Cook, vice president and sales manager of Security Engineering Co., Inc., has appointed Frank De Jarnett as district manager in Venezuela. He will be stationed in Maracaibo and will assist E. R. Poole, Security's division manager stationed in Caracao. De Jarnett's experience includes work with large drilling contractors in Mid-Continent, Rocky Mountain and Pacific Coastal areas. His overseas experience includes 2 years with The Texas Co. in South America.

Brown-Strauss Holds 40th Anniversary Party

More than 1,000 people recently visited the offices and plant of Brown-Strauss Corp., Kansas City, in celebration of the fortieth anniversary of the company. Many of the 39 manufacturers represented by the company prepared displays for the occasion. These manufacturers also had representatives on hand to attend the celebration.

Brown-Strauss carries large inventories of pipe valves and fittings and other goods which it represents. The company also maintains a structural fabricating shop. Since the company was founded in 1908 it has grown from a two-man organization operating from one room to a plant covering 10 acres employing 255 skilled people.

Bill Griffin Becomes Sales Manager Camco

Wilber H. (Bill) Griffin has joined Camco, Inc., manufacturers and distributors of gas-lift equipment, of Houston, as sales manager. He has been with Baker Oil Tools, Inc., since 1936, and at the time of his resignation was divisional sales engineer. He was also in charge of Baker's export department in Houston.

He has served various oil companies and drilling contractors in capacities from roustabout to driller. He has also been associated with Dean Core Drill and Jack Smith Sales Co. During the war Griffin spent much of his time in Trinidad and Venezuela supervising cementing and production work.

Delaney Co., Names W. Powell French

W. P. FRENCH

DeLaney Co. recently appointed W. Powell French as chief engineer of the oil-field division, in charge of designing, supervision of products, development, and testing. French acquired his first oil-field-supply experience with E. L. Wilson Hardware Co., later joining Norvell-Wilder Supply Co. He also has been associated with the Gulf Oil Corp., Gulf Coast Machine & Supply Co., and Oil Center Tool Co., of which he became chief engineer and buyer. French is well known in the Gulf Coast territory.

McMillan Appointed to Monsanto Export Office

Appointment of Paul C. McMillan as manager of the newly created San Francisco office of Monsanto Chemical Co.'s export sales department has been announced.

McMillan has been located in the company's New York export sales office. The San Francisco office will be situated with the Monsanto domes-

tic sales organization at 111 Sutter Street.

McGehee Returns to Truscon Steel Co.

After a year's leave of absence, C. B. McGehee has returned to assume the responsibilities of his former position as general manager of sales, Truscon Steel Co., Youngstown, Ohio.

Indian Drilling Mud Opens New Warehouses

Indian Drilling Mud Co., Inc., now established in its new general office building in Britton, Okla., announces

R. M. ROSS

W. L. POTTER

the opening of new warehouses at Kermit, Bowie, and Odessa, Tex., and Eunice, N. M.

Other warehouses are operated at Medicine Lodge, Lake City, and Garden City in Kansas; Chico and Gainesville in Texas; Shreveport in Louisiana; and Britton, Maysville, Lindsay, Duncan, Seminole, Davenport, Perry, Ringwood, and Elk City in Oklahoma. Eighty-five motor vehicles handle trucking and engineering service from these points.

The company, owned by R. M. "Chief" Ross and W. L. "Blanket" Potter, handled the mud service on the world's deepest hole, 17,823 ft., on the Weller lease at Fort Cobb, Okla. It has also handled the mud on the 1 Vaughn which has more open hole than any other well in the Mid-Continent area, a total depth of 12,098 ft. with 1,000 ft. of surface pipe. Indian Drilling Co. started in business in March 1946. The name was selected because of the Indian ancestry of the two owners.

Patterson-Ballagh salesmen make plans for 1949

Patterson-Ballagh Holds Louisiana Sales Meeting

Jack Magoffin, Mid-Continent division manager for Patterson-Ballagh, recently held a sales meeting of the South Texas and Louisiana field sales and service representatives at Lake Charles, La. The purpose of the meeting was to make sales plans for 1949. Those attending were: F. H. Byers, Robert Kimball, W. B. Gardner, J. M. Newton, Sam Drago, T. M. Smith, Jr., Ralph Snowden, A. G. Colgin, Jr., W. W. Simpson, and Jack Magoffin.

Meeting Sponsored by Diesel Engine Group

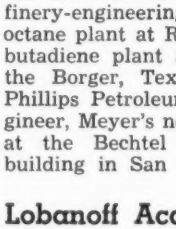
An all-day meeting of mechanical engineering professors was held recently at Shell Oil Co., Inc.'s Wood River, Ill., research laboratories as part of a long-range educational project sponsored by the Diesel Engine Manufacturing Association. The meeting was one of a series being conducted by D.E.M.A. to permit mechanical-engineering instructors to see first hand the processes by which diesel oils are produced and to enable them to hear lectures by oil men on the latest manufacturing processes and research aims.

The following attended the meeting: N. A. Parker, R. F. Larson, D. H. Krans, J. C. Miles and W. L. Hull, of University of Illinois; G. C. Boyer and L. C. Nelson, of Missouri School of Mines; L. E. Stout and H. Kuenzel, of Washington University, St. Louis; L. D. Calhoun and F. J. Burchner, of Fulton Iron Works; and E. L. Dahlund, secretary of the D.E.M.A. educational committee.

Bechtel Names Fred W. Meyer Chief Engineer

Fred W. Meyer has been named chief engineer of Bechtel Corp.'s engineering division. He joined the Bechtel organization in 1942, following 7 years of refinery design and process engineering with Standard Oil Co. of California. He has been active on such major refinery-engineering work as the 100-octane plant at Richmond, Calif.; the butadiene plant at El Segundo; and the Borger, Tex., toluene plant of Phillips Petroleum Co. As chief engineer, Meyer's new headquarters are at the Bechtel Engineering office building in San Francisco.

Lobanoff Accepts Position United Centrifugal Pump



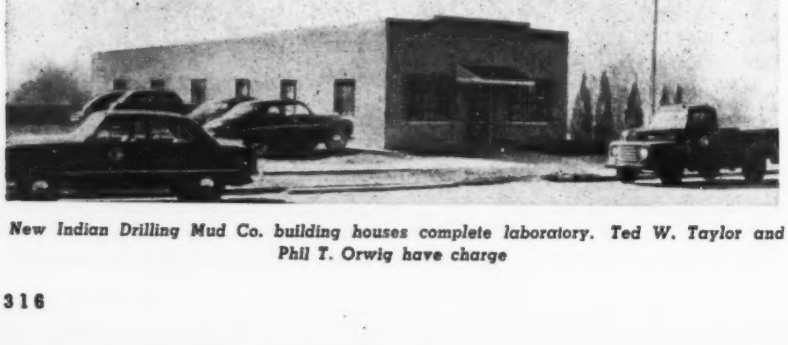
Val Lobanoff has been appointed assistant chief engineer for United Centrifugal Pumps, a division of United Iron Works, Oakland, Calif. His appointment is part of a long-range expansion program required to meet steadily increasing production demands.

Because of previous specialization in refinery and high-pressure boiler feed pumps design, Lobanoff will aid in the development of new lines of centrifugal pumps. For the past 13 years he has been mechanical engineer and assistant chief engineer of a nationally recognized pump manufacturer.

Lincoln Electric Workers Receive Incentive Bonus

Lincoln Electric Co. has distributed $3,821,973 incentive payments to 1,097 workers for the year 1948. These payments, as an average, double the income of every member in the organization, according to J. F. Lincoln, president of the company.

(Continued on page 320)



New Indian Drilling Mud Co. building houses complete laboratory. Ted W. Taylor and Phil T. Orwig have charge

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FOR SALE: Rotary rig, Wilson Giant draw works, 90 foot L. C. Moore mast, Wilson-Snyder 6x16 pump. Allis-Chalmers L-90 and International 110 H. P. motors. All tools and equipment complete except drill pipe located at Hobbs, New Mexico. Price $21,500.00 f.o.b. Hobbs. Address Donald Brown, Postoffice Box 1126, Roswell, New Mexico. Telephone 2973.

MURPHY DIESEL, ME-66

Brand New—Sacrifice—At OEM's Cost 1103 cu. in., 6-cylinder, 180 HP, @ 1200 RPM. Never been used. 20% off list. Contact: Box C-813, The Oil and Gas Journal, Tulsa, Oklahoma.

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2—74,000 BBL. LIKE NEW 114' X 40' TANKS ARE CLEAN—AT MORGANTOWN, W. VA.
1—5000 BBL. BOLTED AT NEW YORK
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For Immediate Delivery

NEW PLAIN HOT ROLLED ANNEALED MILD STEEL SHEETS
Approx. 180 Tons—12 Gauge x 36" x 96"
LOCATED IN NEW YORK
NEW HOT ROLLED MILD STEEL PLATES
Approx. 330 Tons—3/16" x 5' x 15'
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We warrant all of the above to be new prime and mild steel, carbon not exceeding .12 max.

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WELL drilling spudders, beams, light rotaries, core drills, tools, casing. Used equipment at money saving prices. Spang and Mills new tools. Leschen lines. Everything for well drilling. Pressey & Son, Pueblo, Colo.

ONE portable rotary water well drilling rig, dual engines, now operating, good for one thousand feet. Box C-714, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Failing model 44, new motor, radiator and tires. 4½ X 5 Gardner-Denver pump. Failing Automatic chuck. Fred E. Butler, 1013 So. Cedar St., Casper, Wyo.

FOR SALE: We have abandoned several gasoline plants in Oklahoma and have available, cheap, quantity such items as absorbers, centrifugal and steam pumps, gas and steam turbines, steam engines, closed type heater and cooling sections, cooling towers, horiz. engine compressor units. Catalog with prices listing such material available upon request. Cities Service Oil Company, Patridge, Bartlesville, Okla.

FOR SALE

12—230 H.P. Type 10 Bessemer New 17' Power Cylinders complete ready to run with 16" to 18" Compressors. 1—230 H.P. Clark Horizontal with Compressors. Located Salem, Illinois.

ENGLE PETROLEUM, Incorporated
Box 655, Evansville, Indiana

FOR SALE

Three 8000' capacity steam rigs complete with 129' releg derricks and substructure, blowout preventers, drill pipe, and everything ready to put to work. Rigs located at or near Alice, Tex.

For further information, write

AL BUCHANAN DRILLING COMPANY
2114 Alamo National Bldg.,
San Antonio, Texas

or Frank Buchanan, c/o Al Buchanan Drilling Company, Box 1308, Alice, Texas

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

1—4,000' POWER Rotary Drilling Rig complete with 87' Moore Mast and Subbase. 2 EK Waukesha Motors with extension shafts (V-Belt), excellent condition. 6 x 16 Wilson Snyder Power Pump. 5 Drill Collars, Kelly, Etc. Will sell as one unit or separately. Phone 41213, Wichita, Kansas.

SAVE WITH SAFETY—Very Good Used Wire Line—Any Size or Length up to 5,000'—Respooled for Your Inspection—Cable Tools For Sale. General Tool & Supply Co., P.O. Box 4387, Phone 61335, Oklahoma City, Okla.

FOR SALE: New 48" x 30" Triple Sheave Grooved for 1⅛" Wire, McKissick Streamlined Traveling Block. Reduced price. Box C-712, The Oil and Gas Journal, Tulsa, Okla.

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Hydraulic Casing Pulling Units. Complete line of equipment. Units made to your specifications. Truck Mountings or Skid Units Repair Service and Parts.

OKLAHOMA MACHINE & SUPPLY CO.
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SHOT HOLE DRILLS
LARGE AND SMALL

All are truck mounted, rotary chain pull down, smallest pump size 3½ x 5. Some are in excellent condition, others need repairs. Price FOB Dallas from $3,000.00 to $8,000.00 including truck. For details write 8800 Lemmon Ave., Dallas 9, Texas.

BOILERS

125 HP—350 WP

3 ea. Broderick, complete w. superheater, burners, etc.

9 ea. OWS, complete w. burners, etc.

PETROLEUM SUPPLY CO., INC.
Box 644, Bakersfield, Calif.
Phone: 26962

WILSON "GIANT" RIG

COMPLETE WITH OIL WELL PORTABLE MAST

Two RX1V Le Roi 8-Cylinder Engines; B-14 Emsco 7¼" x 14" Pump; Regan Traveling Block; SS-625 Ideco Swivel; 4125 B-J Hook; 27½" Oil Well Rotary; LR Thompson Shale Separator; Web Wilson Tongs; Kohler Light Plant; Water Tank; Tool House; Acetylene Welder; Overshot; Steel Pipe Racks; Mud Mixer; Measuring Reel; Drill Collar Clamp; Weight Indicator; Water Pump; Pipe Straightener; B-J Slip Casing Elevator; Drill Collars; Subs and Necessary Accessory Equipment. 6200' **practically new 4½" Drill Pipe.** Inspect now to best advantage as rig is drilling on 4500' Central Oklahoma well, on completion of which delivery can be made.

LUCEY PRODUCTS CORPORATION
OIL WELL SUPPLIES
TULSA, OKLAHOMA

EQUIPMENT FOR SALE

NEW INVASION PIPE: 15,000 ft.—4" OD, P.E., Electric Weld in random lengths of 20 ft. New Naylor Spiral Weld Pipe: 2500 ft. —8⅝" OD Pipe in 40 ft. lengths. 5000 ft.—16" OD, Used Pipe, with ¼" wall thickness. 1500 ft.—6" Used Spiral Weld Pipe, 30 ft. lengths. 11,000 ft.—10¾" OD, Used, P. E. Line Pipe, Weight 28 and 32 lbs. A. A. Gilbert Pipe & Supply Co., P.O. Box 986—Phones 2-5529 and LD-97, Shreveport, Louisiana.

1—5½ KEYSTONE (Joplin Special), A-1 condition, Electric Starting equipment. Butane Equipment, Kohler light plant, steel doghouse, good cordage and tools—8"-6"-5". J. E. Jolly, Drilling Contractor, 305 North Seminary, Princeton, Indiana.

PIPELINE Construction Equipment for Sale: Pipe cleaning machine with priming head, traveling or stationary, 6" to 12", excellent condition, $1,350. Two T40 International tractors with pipelayer attachments, good condition, very cheap. Contact C. W. Sternberg, 8250 Wier Drive, Houston, Texas. Phone Preston 7043.

FOR SALE: Star 63 Speedster Spudder, excellent condition; two WAK Waukesha Engines completely overhauled; one NK Waukesha engine complete with clutch. All priced to sell. Lesh Drilling Company, Box 305, St. Elmo, Illinois, telephone 261.

PIPE

200,000'—2⅜" Good Used Line Pipe
2" 4 lb. Regular Tubing, steam cleaned
2½" Upset Tubing
25,000' Seamless 5½ O.D. Range 2 & 7" O.D.

A. D. TAGGART—ASSOCIATES
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Lima, Ohio

FOR SALE
Subject to Prior Sale

12,000' New J-55 5½" OD, 15½# Seamless Oil Well Casing, 8 Rd. Thr., Long Coup., Range 2.
20,000' New J-55 5½" OD, 17# Seamless Oil Well Casing, 8 Rd. Thr., Long Coup., Range 2.
15,000' New J-55 7" OD, 20# Seamless Oil Well Casing, 8 Rd. Thr., Long Coup., Range 2.
14,000' New J-55 7" OD, 23# Seamless Oil Well Casing, 8 Rd. Thr., Long Coup., Range 2.
27,000' New N-80 5½" OD, 17# Seamless Oil Well Casing, 8 Rd. Thr., Long Coup., Range 2.
1,800' New J-55 8⅝" OD, 24# Seamless Oil Well Casing, 8 Rd. Thr., Long Coup., Range 1.
1,400' New J-55 10¾" OD, 41# Seamless Oil Well Casing, 8 Rd. Thr., Long Coup., Range 2.

We are also at all times in the market to buy material as described above.

Inquiries Invited

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EQUIPMENT FOR SALE

FOR SALE: One nearly new 2500 Watt A.C. Hercules Light plant with Onan generator, skid mounted in weatherproof housing, used less than one year; One Model XL 12 H.P. Hercules power unit with clutch attached; One 85 H.P. Model H.L. Waukesha Drilling unit with clutch attached, just overhauled; One detachable shear pole head with two sheave block attached; One set 2 inch, Fair pattern tubing elevators; One set 2½ inch, Fair pattern tubing elevators; One set safety rod elevators. All priced to sell. C. H. Barker, Box 91, Toronto, Kansas. Phone 41.

FOR SALE: Wilson Mogul draw works powered by G.A.K. Waukesha engine. Good condition, priced for quick sale. Terms. Melton Supply Company, Seminole, Oklahoma.

BUDA GASOLINE POWER Unit, 164 HP, $1775.00; G.M.C 6-71 Diesel Power Unit, $2000.00. Write or Phone: Werzel Machinery Company, Harrison 0021, 2136 Jefferson Street, Kansas City, Missouri.

For Sale Emsco Mud Pump

Exposed liner type, Model C-12, Serial 213, size 7¼ x 12.

Mounted on skids equipped with suction and hose and 48" V-belt sheave.

Extra gaskets, valves, seats, heads, rods, and 1 set of 7¼ Emsco liner and 1 set of 6¾ Emsco liner.

Pump is in good condition and is up for your inspection in our yard at Great Bend, Kansas.

Crown Oil Company, Inc.
Great Bend, Kansas Ph. 3571

NEW PIPE

16" OD, ⅜" wall, tested 700#—6,000 ft.

12" ID, 10 gauge, tested 300#—30,000 ft.

In Stock at Our Regular Price

H. J. LORENZ CO., INC.
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CAST IRON PIPE

Bell and Spigot Class 150 and 250

2,100 ft. 4 in.		
21,500 ft. 6 in.	**14,250 ft. 10 in.**	**3,000 ft. 20 in.**
16,280 ft. 8 in.	**32,450 ft. 12 in.**	**11,000 ft. 24 in.**

12 ft. and 18 ft. lengths

Immediate Delivery Any Quantity

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THatcher 9243

EQUIPMENT WANTED

ONE spider with slips and one elevator for twenty-four inch O.D. casing. Texas Water Wells Inc., 951 McCarty Ave., Houston 15, Texas.

WANTED: Used Cross Reaction Chamber. Approximately 5' OD x 44' long. State price, condition, location, enclose sketch. Box C-422, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

Natural Gas Booster Compressor with 300 Lbs. minimum discharge pressure, capable of delivering 1½ million ft. of gas per day with an inlet pressure at present at 250 lbs. but expect it to do same work one year later with an inlet pressure between 50 and 100 lbs.

T. A. POMEROY
Box 518
Stroud, Oklahoma

HELP WANTED

OIL Industry Employment Service, 319 Castle Bldg., Tulsa, Okla. Tom Robinson, Mgr., phone 4-5974. No fees to pay. Needed in Persian Gulf area, Middle East. Petroleum Engineers, salary open. Rotary drillers $565. Derrickmen $495. Supervisory chefs $400. Oilfield Welders $425. Truck Foremen $450. Write for details.

EXPERIENCED MUD ENGINEER WANTED

California Drilling Contractor needs qualified man to assume responsibility for mud costs and control on fifteen rigs. This is an excellent opportunity with top salary for the right man. State full qualifications, experience, education, etc., in first letter to Box C-725, The Oil and Gas Journal, Tulsa, Oklahoma.

RESEARCH ELECTROLOGGING ENGINEERS

(a) Supervisor for research project on a study of fundamentals of electric logging of wells. Advanced degree and training in physical chemistry and/or physics desirable.

(b) Research assistant for above project. Salaries open for above positions. Opportunity for graduate study leading to advanced degree. Address letters containing summary of training, experience, and personal data to Director of Mineral Industries Research, The Pennsylvania State College, State College, Pennsylvania.

ENGINEERING

During the next several months we will increase our Engineering Organization engaged in the design of Oil Refinery Plants and Power Plants. Location Cleveland, Ohio. The men we need should be qualified as draftsmen, designers, checkers or in higher engineering skills on design of piping, instrumentation, pressure vessels, structural steel, concrete, mechanical or electrical. For presenting your qualifications and prompt consideration, write to us for application form.

ARTHUR G. McKEE & CO.
2300 Chester Ave., Cleveland 1, Ohio

HELP WANTED

WANTED: Capable and experienced geologists thoroughly familiar with Mid-Continent and Gulf Coastal areas, wanted by independent producer. Give record of past employment. Liberal salary and fine opportunity for top men. Correspondence held strictly confidential. Address Box C-728, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Accountant experienced in Refinery Property and Yield accounting. Give full details of training and experience in first letter. Write Box C-711, The Oil and Gas Journal, Tulsa, Oklahoma.

ROCKY MOUNTAIN AREA oil jobs our specialty. Petroleum engineers, geologists, chemists, surveyors, draftsmen, write for information. Professional Placement Service, 613 Mack Bldg., Denver, Colo.

WANTED

By Major Oil Company — Experienced Petroleum Economist-Statistician. Good opportunity for young man. State age, experience, and salary requirement. Box C-726, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT
In
SAUDI ARABIA

ENGINEERS

Maintenance: ME's, EE's, CE's
Power Engineers and Assistants
Process and Chemical Engineers

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Surface Mapping
Sub-Surface
Economic

SENIOR PALEONTOLOGIST

SURVEYORS

Triangulation
Recorder-Triangulation
Precise Leveling

OPERATORS

Production, Gas Oil Separators, Topping Still, Natural Gasoline Plant and Auxiliary Power Plants

Career employment opportunities. Room and Board furnished. Paid vacation in U.S. after each 24-month period. Retirement plan and liberal benefits.

If interested, apply by letter giving complete employment and personal history.

ARABIAN AMERICAN OIL COMPANY
200 Bush Street Dept. 'A'
San Francisco, California

HELP WANTED

NEW, fast-growing company in Gulf Coast Area is interested in receiving applications from qualified sales executive capable of distributing approximately two million pounds per year of automotive, marine, and industrial lubricating greases produced in our modern plant. State complete background and salary requirements, or other basis of remuneration, in letter. Replies confidential. Box C-716, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Geologist for supervisory and administrative duties exploration and drilling project Middle East. Should have some experience in seisimc and surface work. Age 30 to 45. Reply Box C-704, The Oil and Gas Journal, Tulsa, Oklahoma.

DISTRICT MANAGER: For sale of mud system equipment. Headquarters in Casper, Wyoming. Must have a thorough knowledge of Rocky Mountain fields and rotary drilling operations and a background of successful sales experience. Salary and other considerations commensurate with qualifications. Replies will be regarded as strictly confidential. Send details of qualifications and recent photograph, together with personal data, age, education in first letter. Mud Products, Inc., 508 Philtower Bldg., Tulsa, Oklahoma.

SALES ENGINEER
Experienced in gas compressing equipment. Address Manager of Sales, The J. B. Beaird Company, Inc., Shreveport, Louisiana.

UNITED GEOPHYSICAL COMPANY, INC.

has openings in both North and South America and the Middle East for

Experienced Seismic
Party Chiefs
Seismologists
Computers
Observers
Drillers

595 East Colorado Street, Pasadena 1, California

SITUATIONS WANTED

GRADUATE GEOLOGIST, 10 years experience, six years supervisory capacity. Qualified for district or chief geologist. Central Texas and Rocky Mts. Box C-718, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE Engineer presently employed as Assistant Chief Engineer for major oil company desires new position. Qualified for field and office administration, supervision and planning. Experienced in design and construction of residential, industrial and commercial buildings and attendant facilities; pipe lines, pump station and tank installations; road building and docks. Capable of organizing and supervising large engineering department. Available after January 20. Box C-727, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: U. C. graduate, age 33, six years' experience, geophysics, well and subsurface geology, bachelor and able to go anywhere but prefer the U. S. Available in April 1949. Box C-724, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF CHEMIST of majors' subsidiary company foreign complete refinery desires manufacturing or research position. Age 34, supervisory and research experience include fuels, lubes and catalysts. Western non-metropolitan location preferred but will consider other desirable areas. Available next summer. Box C-729, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING-PRODUCTION Superintendent, graduate Petroleum Engineer. Age 36. Fifteen years experience Mid-Continent, Rocky Mountains, Appalachians and Gulf Coast drilling, production and completion. Experience as Superintendent major service company, industrial department major oil company and now employed as Production Superintendent major oil company. Desires change to improve salary and opportunity. Will go anywhere including South America. Box C-730, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

DEEDED ROYALTIES
San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington, New Mexico.

ROYALTIES IN HOT AREAS!
Recent strikes have focused attention on Montana's deeper oil zones and major companies are moving fast, drilling and leasing. We buy direct in the field, sell direct to our customers. Write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

WE will buy producing or non-producing oil royalties. Standard Security Company, 115 Broadway, New York 6.

LEASE AND DRILLING BLOCKS

830-ACRE block, Osage County, Oklahoma. Near production with four sands 1600 to 2050'. Will farm out block to responsible operator who is financially able to drill several wells and develop block. Box C-652, The Oil and Gas Journal, Tulsa, Oklahoma.

PROSPECTIVE new shallow, high gravity oil field, N.W. Ga. Mississippian, Devonian, shale and limestone exposures. Good structural indications. Drilling deals considered. Dietzen, Rt. 3, St. Elmo, Tenn.

LEASES ROYALTIES
PRODUCING OR NONPRODUCING
Texas, New Mexico, Oklahoma, Louisiana and Illinois
Inquiries Invited
B. D. BUCKLEY
60 Broadview Drive, Clayton (5), St. Louis, Missouri

REAL ESTATE

AVAILABLE immediately, manufacturing facilities consisting of large processing tanks 300,000 gallon storage capacity, tank car handling, 10,000 square feet warehouse, two 125 H.P. gas fired boilers, RR siding, labor plentiful. Location, Wichita Falls, Texas. Write Box C-710, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908. Oil-Gas (all states), Business, Real Estate, Legal Forms, Leases, Revised With Government Regulations, Commercial Printing, Catalog and Samples on request. Burkhart Printing & Stationery Company, 118 South Cincinnati, Tulsa 3, Oklahoma.

FOR SALE

ALUMINUM PAINT—200—6 gallon cans, Exterior Spar Varnish vehicle. Highly polished, Aluminum Paste pigment in separate container. Distributors Liquidation. Regular price $33.60—take any part, $12.00 per 6 gallon can. Send check with order. The National, 606 Walnut, Kansas City, Missouri.

SMALLEST, Prettiest, Miniature Tri-Cone Rock Bit made. Less than one-half inch diameter. Cones turn. Gold or Nickle plate. On tie chain clasps, strap type for watch fobs and ring type for charms. $5.00 each Money Order or C.O.D. H. McGaughey, P. O. Box 11063, Houston, Texas.

FOR SALE:
KANSAS WELL LOGS
Complete and up to date set Kansas well logs. Filed in Folders by townships and ranges. Address inquiries to:
323 Beacon Bldg.
Tulsa, Oklahoma

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell, Registered Patent Attorneys, Suite 418, 815-15th Street, N.W., Washington 5, D. C.

GEOPHYSICAL SERVICE

RADAR SURVEYS—Outline areas of possible saturation. Also Show faults. For further information write, Geotronic Laboratories, 421 S. Locust Street, Centralia, Illinois.

Equipment Men

(Continued from page 316)

Ensign Carburetor Modernizes Factory

Ensign Carburetor Co. has recently completed a program of factory modernization and new-product development, including a new model "S" butane regulating unit as well as a line of larger carburetors for butane-propane and natural-gas engines in excess of 450 hp.

New and larger experimenting and testing equipment has also been installed to fill present needs as well as anticipated requirements. This includes a General Electric dynamometer which easily tests engines of 500 hp. for speed and other important characteristics.

Electronically controlled fuel-weighing mechanism has also been installed to provide accurate measurement of fuel consumption during any portion of a test.

Lincoln Electric Names New District Managers

C. W. Lytton has been made district manager for the Buffalo area of Lincoln Electric Co. His office is located at 1700 Niagara Street, Lytton started with the company shortly after his graduation from Case Institute of Technology in 1931. Before going to Buffalo he was district manager at Oil City of the northwestern Pennsylvania district. This office was later moved to Franklin, Pa.

C. M. Richardson has been appointed district manager for the northwestern Pennsylvania district, with offices at 741 Liberty Street, Franklin.

He has been engaged in sales engineering for Lincoln for the past 12 years in Ohio, Wisconsin, Illinois, Iowa, and Buffalo. In 1942 he was made district manager at Toledo.

Ray Zeh has been appointed district manager of the Toledo district and maintains offices at 663 Spitzer Bldg. He worked in the factory for a year and a half in the experimental department and was then transferred to the sales-engineering department. Starting with the company in 1937, he has been associated with the Milwaukee office for the past 10 years.

Ryerson Breaks Ground for Addition to Chicago Plant

Joseph T. Ryerson & Son, Inc., pioneer Chicago steel firm, has begun construction of a large brick and steel addition to its Chicago plant which will provide approximately 118,000 sq. ft. of modern plant and office space. Completion is scheduled for November 1949. This is the initial move in a series of planned additions and improvements which, according to President Everett D. Graff, will ultimately result in large-scale expansion and modernization of the entire Chicago property.

The new building, an L-shaped structure, will be erected at 15th and Rockwell Streets, becoming a part of what is known as the north unit of the three-block plant. Construction includes a two-story office building, which will provide about 12,000 sq. ft. of office space.

Huston Begins 74th Year With Lukens Steel Co.

What is believed to be a unique record in the annals of American industry has been marked by Charles Lukens Huston, who has begun his seventy-fourth year of continuous service with Lukens Steel Co. Huston, grandson of Dr. Charles and Rebecca Lukens, for whom the company is named, now in his ninety-third year, started with the concern on December 15, 1875, as a clerk and bookkeeper. Today, as first vice president, he is still spry of foot and keen of interest, and he walks to his office daily from his nearby home.

When Huston entered the employ of the firm in 1875, it had about 120 workmen and its plant occupied a site of less than a dozen acres. He has seen it pioneer and develop from a producer of first, iron, and later, steel plate to a producer of steel-plate specialties, employing upward of 5,300 men and women, with a plant covering 600 acres.

Wheelco Opens Houston Office

Wheelco Instruments Co., Chicago, announces the opening of a new district office at 2204 Fannin Street, Houston. The new office, under the direction of George Hatfield, formerly of the Chicago sales office, will handle sales and service for the states of Texas, Louisiana, and New Mexico.

Dearborn Chemical Makes Appointments

Dearborn Chemical Co., Chicago, has added E. Stewart Carlson to its advertising staff. Carlson comes to Dearborn from the Chicago Tribune. He has also been on the advertising staff of General Electric X-Ray Corp., and Mishawaka Rubber & Woolen Manufacturing Co.

William J. Tobin has been appointed sales representative in the Minnesota territory which was formerly assigned to the late A. A. Turner. His headquarters will be in the Minneapolis-St. Paul area.

Roy O. Benson, a member of Dearborn's laboratory and research staff for the past 11 years, has been assigned as sales representative to the Chicago territory formerly covered by E. W. Houseknecht who has been appointed sales representative in the Wisconsin territory. He will make his headquarters in Appleton, Wis.

Wright, O'Neill Promoted By Blaw-Knox Co.

Chemical Plants division of Blaw-Knox Co. has announced the promotion of E. S. Wright to manager of construction and W. F. O'Neill to succeed Wright as general superintendent of construction.

Wright joined the organization in 1942 and has since been active in every phase of the division's construction activities. Prior to his connection with Blaw-Knox, Wright was engaged in general contracting in Philadelphia and for many years was employed in the oil-refining and chemical-processing industries. Prior to joining Blaw-Knox in 1941, O'Neill was in the construction industry on the West Coast.

Redpath Manages Plant For Joseph T. Ryerson

W. A. Redpath has been appointed manager of the Philadelphia plant of Joseph T. Ryerson & Son, Inc., steel distributors, to succeed C. L. Hardy, effective January 1, 1949. Hardy was recently elected assistant vice president of the Ryerson organization, with headquarters in Chicago.

Redpath began his career with Ryerson in February 1916, and became Chicago city sales representative in 1927. He was promoted to the post of assistant manager of sales, Chicago plant, in 1945. He remained in this position until his recent appointment as manager of the Philadelphia plant of the Ryerson company.

Jefferson Chemical Selects Texas for Research Plant

Plans for establishing consolidated research facilities by Jefferson Chemical Co., Inc., in Austin, Tex., have been announced by P. M. Dinkins, Jefferson's president. Research, process development, and pilot-plant activities now being carried on in New York City and Port Arthur will be combined in the new location.

The property chosen covers 69 acres and includes 5 buildings on 7 acres of improved land. Jefferson was

formed in 1944 by The Texas Co. and American Cyanamid Co. and is owned jointly by them.

Hammond Iron Names Faville-LeVally Corp.

Appointment of Faville - LeVally Corp., 105 West Adams Street, Chicago, as exclusive representative in Southern Michigan is announced by Hammond Iron Works of Warren, Pa., and Port Neches, Tex.

Faville-LeVally is thoroughly acquainted with the requirements of the petro-chemical industries in relation to Hammond products and services, including the design, fabrication, and erection of storage tanks, gas holders, pressure vessels, and general plate work.

Core Laboratories Pays Profit-Sharing Benefits

Core Laboratories, Inc., petroleum reservoir - engineering firm, has announced completion of the first year of its employe profit-sharing plan. All employes having more than 1 year of service have been mailed bonus checks in amounts varying from 15 to 35 per cent of their present annual salary and computed upon years of service to the organization. Personnel having less than 12 months service have received Christmas bonus checks. A similar plan will be in effect in 1949.

Nooter Completing Expansion Program

As concluding phase of its $500,000 expansion program, The John Nooter Boiler Works Co., St. Louis, has purchased major items of equipment out of the Mount Vernon, Ill., plant of J. P. Devine division, H. K. Porter Co., Inc.

Included in the purchase is a bending roll capable of processing steel plates up to 2 in. thick and to 20 ft. in width. The purchase also included Devine's car-bottom, or track-loaded, annealing furnace. Many other items used in fabricating heavy steel and alloy plate products were also purchased.

Shumaker Made District Manager National Supply

Appointment of George H. Shumaker as district manager of its Michigan district has been announced by National Supply Co. He will make his headquarters at Mount Pleasant, Michigan. H. H. Tschappat has been made assistant district manager.

Shumaker started his career with National Supply in 1938 as a clerk in the company's Centralia, Ill., store. Later he was made assistant district manager of the Illinois district, at Olney, Ill.

Jessop Steel Appoints District Sales Manager

Jonathan D. Freeze has been appointed district sales manager for the New York territory of Jessop Steel Co. His offices are at 30 Church Street, New York.

Freeze was formerly associated with Armco International Corp. in various capacities, both here and abroad. Most recently he was Chicago representative for Fritz W. Glitsch & Sons, Inc. He has also been a sales engineer for U. S. Steel Export Co. and was assistant manager of the Tin Plate division of Crucible Steel Co.

Modine & Co. Serves As Contractors, Designers

Modine & Co., Edwardsville, Ill., has been formed to act as contractors, designers, and erectors of complete turnkey jobs or subcontractors for refining, gas-processing, and cycling plants. Ted P. Modine is president. Modine & Co. is affiliated with Dobe Piping Co., pipe fabricators.

Oil Well Appoints New Store Managers

S. M. Miller has been named manager of the Pampa, Tex., store of Oil Well Supply Co., and C. V. Black has succeeded him as manager of the store at Abilene.

Harvey E. Smith has been named manager of the Oil Well Supply Co. store at Bridgeport, Ill.

Early Represents Askania

Askania Regulator Co., Chicago, manufacturer of precision controls for industry, announces appointment of Frank E. Early as its representative in the Detroit area. Early has worked with Askania in various capacities since 1936.

CALENDAR OF EVENTS

1949

January

Society of Automotive Engineers, annual meeting, Book-Cadillac Hotel, Detroit, Mich., January 10-14.

Society of Automotive Engineers, fuels and lubricants, Engineering Societies Building, New York, January 27.

February

American Institute of Mining and Metallurgical Engineers, annual meeting, Fairmont Hotel, San Francisco, February 13-17.

American Society for Testing Materials, spring meeting and A.S.T.M. committee week, Hotel Edgewater Beach, Chicago, Ill., February 28-March 4.

March

National Association of Corrosion Engineers, annual convention, Cincinnati, Ohio, March 7-10.

American Petroleum Institute, Southwestern district, Galvez Hotel, Galveston, Tex., March 9-11.

American Association of Petroleum Geologists, regional meeting; Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Jefferson Hotel, St. Louis, Mo., March 14-17.

American Petroleum Institute, division of production, Mid-Continent district meeting, Mayo Hotel, Tulsa, March 23-25.

New England Gas Association, Hotel Statler, Boston, March 24-25.

American Petroleum Institute, division of production, Mid-Continent district, Mayo Hotel, Tulsa, March 23-25.

Western Petroleum Refiners Association, thirty- seventh annual meeting, Plaza Hotel, San Antonio, Tex., March 28-30.

American Chemical Society, division of petroleum chemistry, spring meeting San Francisco, March 27-April 1.

April

American Petroleum Institute, division of Refining, mid-year meeting, Shamrock Hotel, Houston, April 4-7.

American Society of Lubrication Engineers, annual meeting, Pennsylvania Hotel, New York, April 11-13.

National Association of Corrosion Engineers, annual convention, Netherlands Plaza Hotel, April 11-14, Cincinnati, Ohio.

Southwestern Gas Measurement Short Course, University of Oklahoma, College of Engineering, Norman, Okla., April 12-14.

National Petroleum Association, Hotel Cleveland, Cleveland, Ohio, April 13-15.

Natural Gasoline Association of America, annual meeting, Texas Hotel, Fort Worth, April 20-22.

Southern Gas Association, annual convention, Buena Vista Hotel, Biloxi, Miss., April 20-22.

Amercian Petroleum Institute, Eastern district, William Penn Hotel, Pittsburgh, Pa., April 27-29.

May

Independent Petroleum Association of America, mid-year directors meeting, New Orleans, La., May 2-4.

Amercian Gas Association, natural-gas department, spring meeting, French Lick Springs Hotel, French Lick, Ind., May 9-10.

American Petroleum Institute, division of production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles, Calif., May 12-13.

Amercian Petroleum Institute, Rocky Mountain district, Gladstone Hotel, Casper, Wyo., May 26-27.

Natural Gas and Petroleum Association of Canada, annual meeting, Hotel London London, Ont., Canada, May 26-27.

June

American Society for Testing Materials, fifty-second annual meeting, Hotel Chalfonte Haddon Hall, Atlantic City, N. J., June 17-July 1,

September

National Petroleum Association, Hotel Traymore, Atlantic City, N. J., September 14-16.

October

National Lubricating Grease Institute, Hotel Roosevelt, New Orleans, La., October 3-5.

American Gas Association, annual convention, Chicago, Ill., October 17-20.

NOMADS

Houston Nomads, second Monday of each month. The Houston Club, Houston.

Los Angeles Nomads, second Wednesday each month, Jonathan Club.

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Richfield Sells West Texas Leases on 59,206 Acres

At a public auction held in Midland, Tex., early in December, Richfield Oil Corp. sold oil and gas leases on undeveloped spreads totaling 59,206 acres in West Texas for an aggregate $706,573.

InTex Oil Co. of Dallas purchased leases on 13,984 acres in northwest Scurry County and northeast Borden County for $505,000. Tide Water Associated Oil Co. paid $83,330 for lease on 11,073 acres in south-central Martin County. Amerada Petroleum Corp. leased 26,559 acres in northeast Midland County and northwest Glasscock County for $61,167. Malco Refineries, Inc., of Roswell, N. M., bought leases on 7,590 acres in northwest Crockett County for $57,076.

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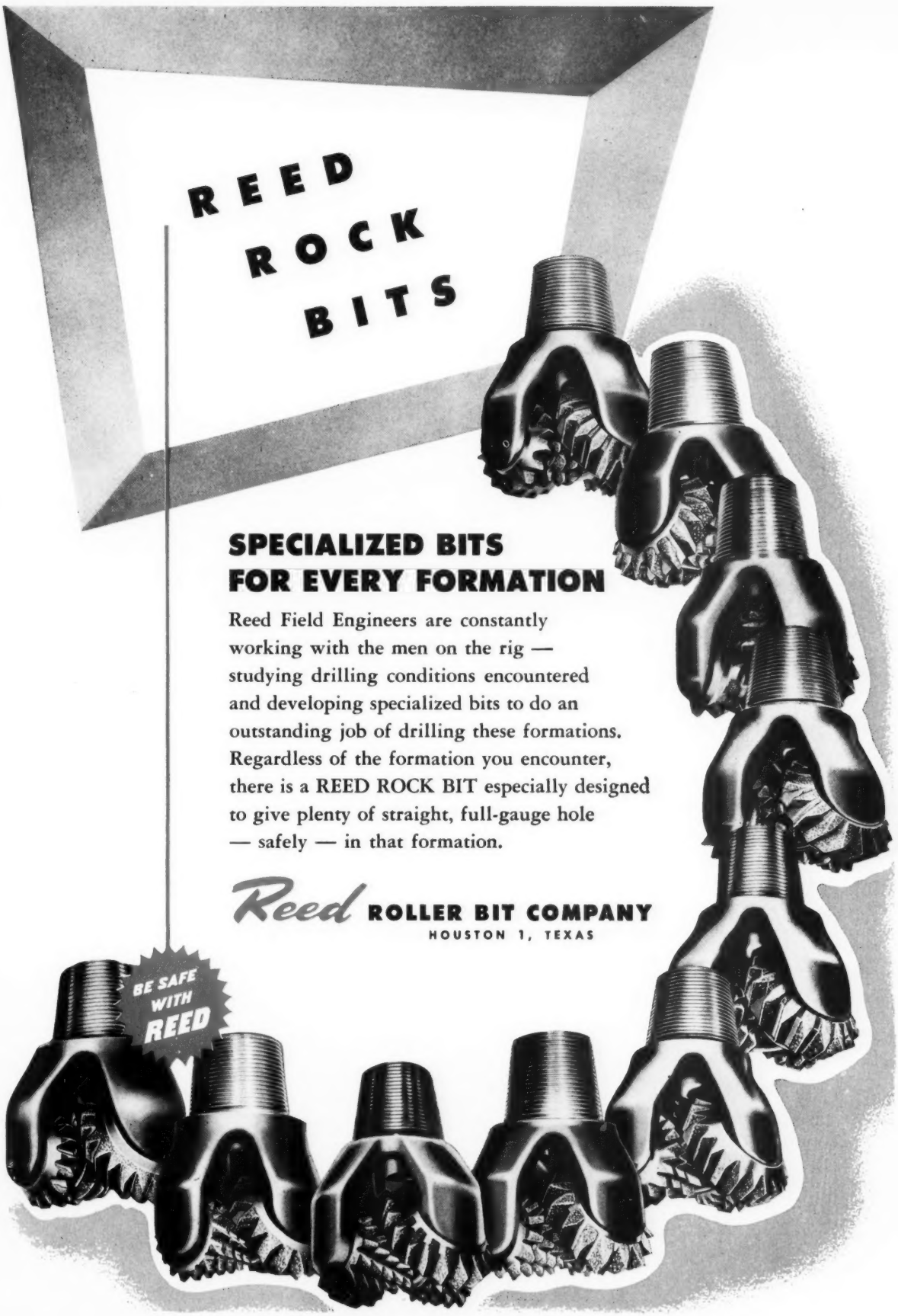
REED ROCK BITS



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